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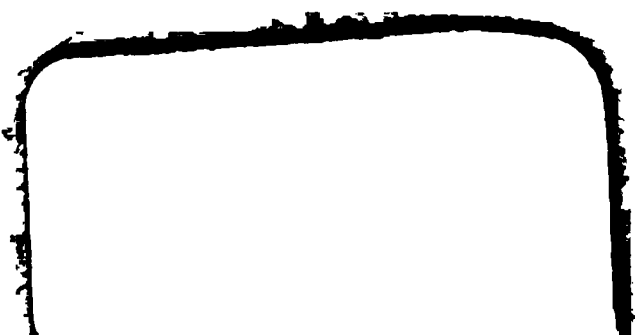
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ANNUAL
OF THE
UNIVERSAL MEDICAL SCIENCES

A YEARLY REPORT OF THE PROGRESS OF THE GENERAL
SANITARY SCIENCES THROUGHOUT THE WORLD.

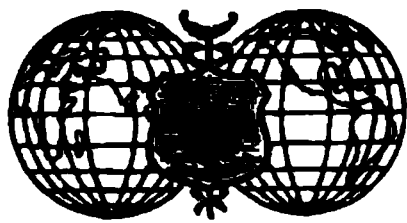
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SURGERY OF THE BRAIN AND NERVES.

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CEREBRAL SURGERY.

CEREBRAL LOCALIZATION AS APPLIED IN THE OPERATIVE TREATMENT OF ENDOCRANIAL LESIONS.

A. W. HARE,⁶ after referring to the researches of Hitzig, Fritsch, Ferrier, and others, comes to the conclusion that the surface of the brain may be mapped out into a series of topographical areas, each of which occupies a definite relationship to some well-defined function: motor, sensory, or psychic. Of the areas connected with psychic activities little is at present known. They are generally believed to occupy the frontal lobes of the brain. In the case of motor functions, very definite conclusions have now been arrived at.

In the parietal region, grouped around the fissure of Rolando, are the

FIG. 1.—MOTOR AREAS.
(*London Lancet.*)

areas associated with movements of the extremities of the opposite side of the body, and at the lower end of the fissure those related to movements of the mouth and tongue. In the accompanying diagram (Fig. 1) the motor areas have been marked in their anatomical relation to the other structures of a normal head, dissected for the purpose, and showing the brain in its natural position. The areas associated with movements in neighboring regions of the body have been shaded alike in the figure. Thus the areas A, B, C, and D, bounding the fissure of Rolando posteriorly, and 5 and 6, in front of the fissure, together with 2, 3,

and 4, at its upper end, are those in functional connection with the upper extremity; A, B, C, and D being concerned in the movements of the fingers, hand, and wrist, 5 in a forward movement of the arm, 6 in pronation and supination of the forearm, and 2, 3, and 4 in co-ordinated movements of the whole upper extremity. The areas, 7, 8, 9, 10, and 11, indicated as having a common region of motor representation, are related to movements of the tongue and of the muscles around the mouth. Area 1 represents in part movements of the lower extremity. In the same way areas of representation of general and of special sensation are located by Ferrier around the horizontal limb of the fissure of Sylvius. It must not be overlooked that this mapping out of areas has an absolute exactitude only in the case of the species of ape upon which the experiments were performed. Its bearing in the human subject is one of great relative importance, but it must not be looked upon as a final statement of fact in the case of man until each area can be shown to be correctly placed as it is by the accumulation of a sufficient number of clinical and of post-mortem observations directly confirming the method employed.

In the study of cranio-cerebral topography the surgeon has to rely on four primary landmarks in establishing a system of measurements. These are the glabella, or root of the nose, which bears a definite relation to the anterior limit of the cranial cavity, and the occipital protuberance, or inion, which bears a similar relation to its posterior end, corresponding to the junction of the falx with the tentorium. The whole mass of the cerebrum is disposed between these two points, and they bear definite relations to its cortical matter, uninfluenced by the structure and contour of the bones forming the vault. The third constant landmark is the external angular process of the frontal bone, which bears a relation to the lateral expansion of the frontal lobes similar to that borne by the two prominences already mentioned to the anterior and posterior extremities of the cerebrum. It has also a uniform relation to the fissure of Sylvius. Lastly, the parietal eminence is of value, since it marks the greatest lateral expansion of the substance of the hemisphere, and, as Turner has shown, bears a special relation to the supramarginal convolution. To find the upper end of the fissure of Rolando by the use of these data, the surface measurement in the middle line of the head

should be taken over the scalp from the glabella to the occipital protuberance. In ordinary adult heads this will vary from eleven to thirteen inches; measured along this line from before backward, the distance from the glabella to the top of the fissure will be 55.7 per cent. of the total distance from the glabella to the occipital protuberance. The following scale shows the distance from the glabella to the top of the fissure in all ordinary heads:—

When the distance from the glabella to the occipital protuberance is	The distance from the glabella to the upper end of the fissure of Rolando is
11 inches,	$6\frac{1}{8}$ inches.
$11\frac{1}{4}$ "	$6\frac{3}{8}$ "
12 "	$6\frac{5}{8}$ "
$12\frac{1}{4}$ "	7 "
13 "	$7\frac{1}{8}$ "

To find the top of the Rolandic fissure Thane halves the distance from the glabella to the occipital protuberance, and, having thus defined the middle point of the vertex, takes a point half an inch behind it as the location of the upper end of the fissure. Having thus ascertained the upper end of the fissure, it is desirable to determine its length and direction. The scalp measurement corresponding to its length is three and three-quarter inches. It runs from above downward and forward, its axis making an angle of sixty-seven degrees with the middle line. In order to obtain practical value to the foregoing facts, an instrument has been devised by Claude Wilson, combining the scale of measurements for localizing the fissure with those data representing its length and direction. This instrument (Fig. 2, Wilson's cyrtometer) consists of three strips of flexible metal and a tape for securing it *in situ*. The method of its application is illustrated in the next illustration (Fig. 3).

The broadest transverse strip passes coronally around the forehead, corresponding with the glabella and external angular process; the narrower longitudinal strip passes backward from the glabella in the middle line to the occiput. This strip is marked with two scales of letters, capitals in its posterior fourth and small letters about the middle of the strip. These two scales bear a relation to one another calculated to suit in the application of the instrument to any ordinary head. Measured from the glabella backward, the distance to any given small letter is 55.7 per cent. of the distance from the glabella to the corresponding capital letter; thus, when

any capital letter will coincide with the top of the fissure, a third narrow, reversible strip strikes on the longitudinal strip of metal, marking an angle of sixty-seven degrees, opening forward and marked at three and three-quarter inches from its attached end, thus giving the length and direction of the fissure on the surface of the head. To determine the exact location and direction of the fissure, a line is drawn from the external angular process of the frontal bone backward to the occipital protuberance, taking the shortest route between these points. Such a line droops a little toward the external auditory meatus, avoiding the greater con-

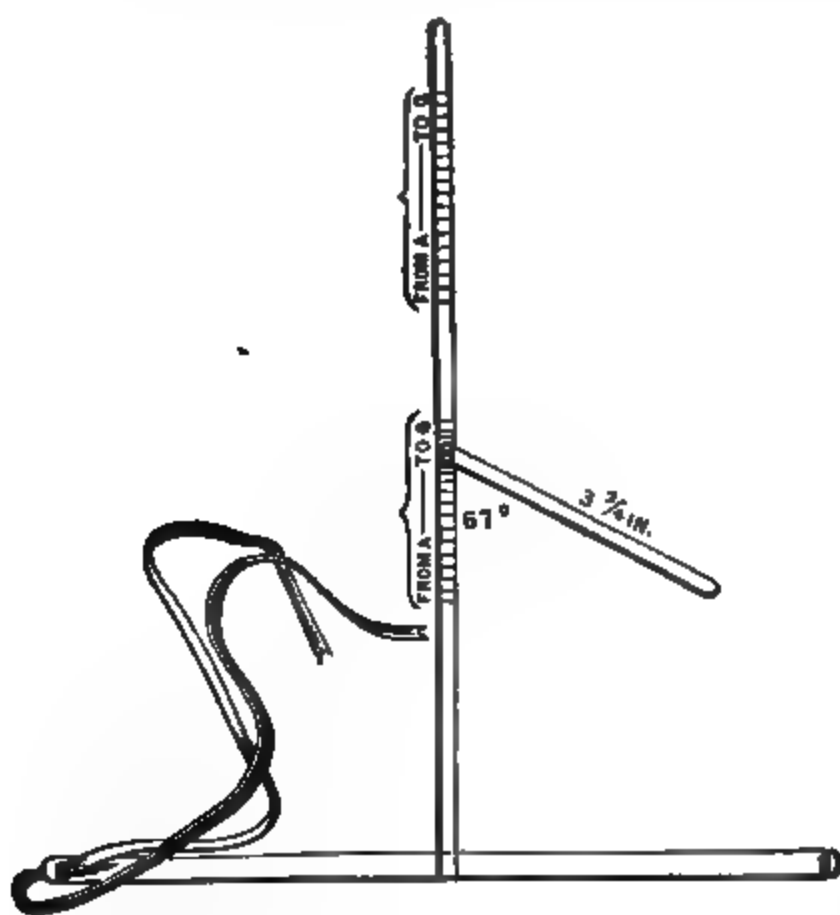


FIG. 2.—WILSON'S CYRTOMETER.
(*London Lancet*.)

R

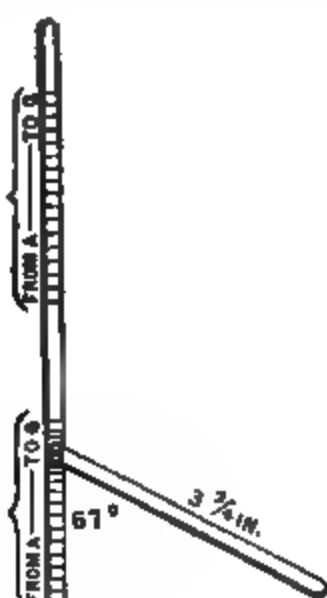


FIG. 3.—WILSON'S CYRTOMETER
(*in situ*).

G, glabella; E & F, external angular process;
R, fissure of Rolando, its position and direction
marked by the lateral strip of metal.

vexity of the skull, which lies in the course of a horizontal line between the bony prominences. It usually passes about half an inch above the meatus, and thus closely corresponds to the floor of the middle fossa and behind runs parallel to and nearly in the same course with the attachment of the tentorium and the posterior half of the lateral sinus. A measurement of an inch and one-eighth along this line backward from the external angular process marks the lower end of the fissure of Sylvius. From this point a straight line drawn to the centre of the parietal eminence marks accurately the course of the posterior limb of the fissure. The

main line of the fissure follows the line of the squamoparietal suture to its highest point, whence it continues its course to the parietal eminence. The middle meningeal artery, after grooving the inner surface of the great wing of the sphenoid, passes on to the anterior angle of the parietal bone, and is distributed to the dura mater lining the anterior and superior half of that bone. If the surgeon desires to expose the tip of the temporosphenoidal lobe, he should trephine behind the upper extremity of the great wing of the sphenoid; if to expose Broca's convolution, immediately in

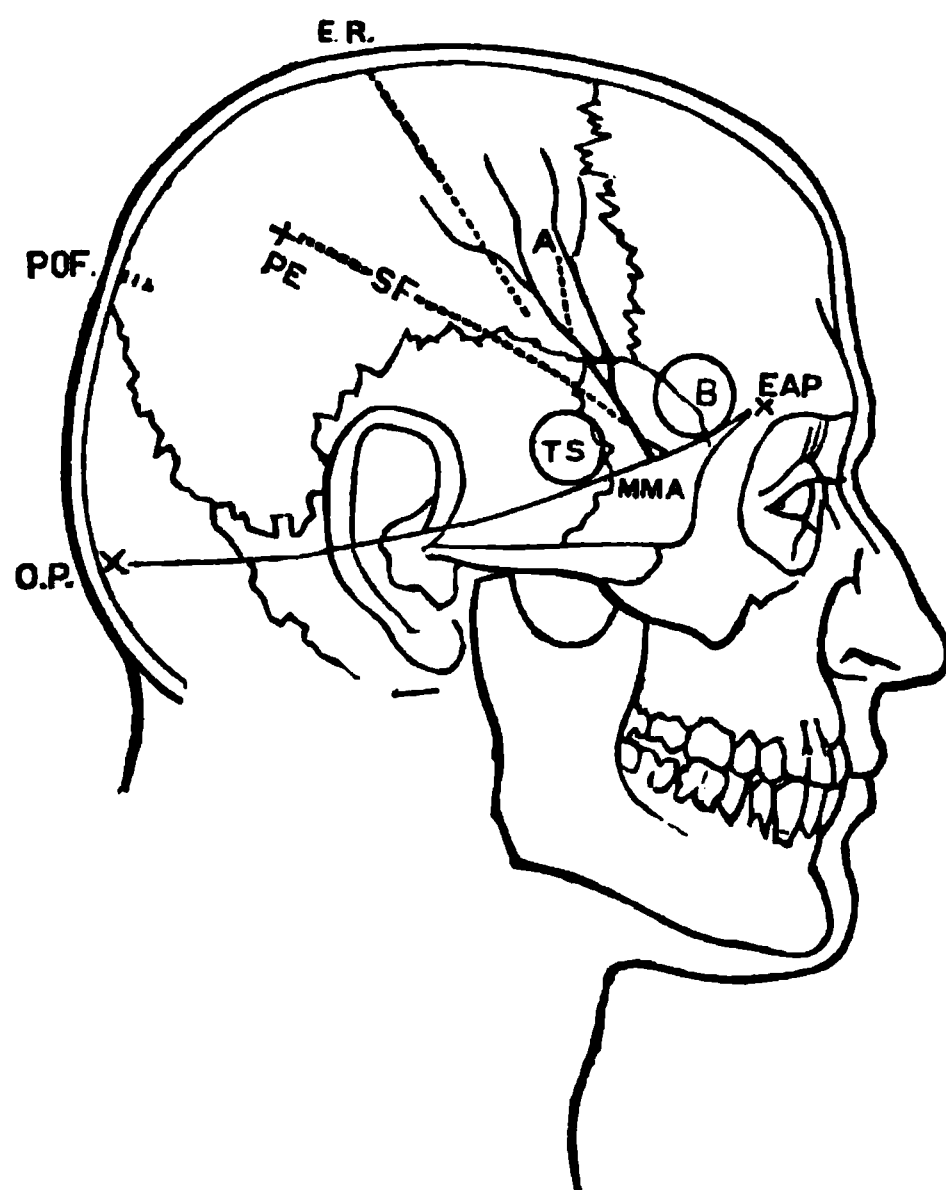


FIG. 4.—HEAD, SKULL, AND CEREBRAL FISSURES (ADAPTED FROM MARSHALL).

O P, occipital protuberance; E A P, external angular process; S F, Sylvian fissure; A, its ascending limb; F R, fissure of Rolando; P E, parietal eminence; M M A, middle meningeal artery; T S, tip of temporosphenoidal lobe; B, Broca's convolution

(*London Lancet.*)

front of the same bony peninsula. The sites of the two operations are shown in Fig. 4.

Bullard⁶¹ reports a case of double trephining for acquired spastic hemiplegia in a child four and a half years of age, where he was able, by cerebral localization, to fix the lesion during life. The child had been delivered by forceps, and showed a scar and depression over the right parietal bone, supposed to have been caused by the forceps. Intellect limited; can only speak a few simple words. A scar, an irregular prominence, and depression in front of the occipitoparietal depression. No points of tenderness

over any part of the head. Special senses normal. Right internal strabismus. Right upper extremity can be moved somewhat, but is never used. It is in a condition of spastic paralysis. Forearm semiflexed and hand firmly flexed on the forearm. Moves the left upper extremity better than right, and always grasps objects with the left hand, and then holds them firmly. Right lower extremity small and colder than left, with spastic condition of knee and ankle. Foot in equinus position, with toes pointing downward. Can move the limb somewhat; left leg weak, perhaps from disease, otherwise nearly normal; knee-jerk increased on both sides. Cannot walk or stand without assistance. Sensation normal over the whole body. The fissure of Rolando was located on the shaven scalp, and an inch trephine applied over the point of depression. The button of bone removed showed that a fracture had existed, but the bone was only slightly depressed, and the meninges appeared perfectly healthy, and no abnormal intracranial pressure existed. In the absence of lesions which would explain the serious symptoms for which the operation was undertaken, it was decided to trephine at a corresponding point on the opposite side. The trephine was applied a little higher and slightly further forward than on the right, at the junction, as nearly as could be determined, of the middle and lower thirds of the fissure of Rolando. The dura mater was found firmly attached to the bone, and the removal of the disk of bone revealed a depression in the brain substance—a parencephalic cavity. This depression measured one and one-half inches by three-quarters of an inch in depth. Considerable hæmorrhage followed the removal of the bone, but was promptly arrested by plugging. Buttons replaced and wounds closed. The patient was feeble at the time of operation, and never rallied from its effects, and died seventeen hours later. Bullard attributes the brain lesion to injury inflicted upon the cranium and contents by the forceps. The lesion was located at a point almost directly opposite the fracture, and was probably caused by a rupture of the ascending parietal artery or one of its branches.

Another case of paralysis caused by a fracture of the skull during infancy and treated by trephining, is reported by Felkin.²² Feb. 22 The patient was a girl, fourteen years of age. When ten months old a brick fell from a height and struck her on the left side of

the head. For six weeks she remained in an insensible condition. After this time consciousness returned, but the right extremities were paralyzed. The paralysis remained, and the limbs developed only partially, both being two inches shorter than on the opposite side. There was deep depression in the skull about two inches and a half above the left ear. Trephining at the site of depression was done by Hare. Over the depression in the bone there was found a smooth membrane, which proved to be the outer wall of a cyst two inches in depth. The cyst was opened, and a scrous fluid escaped. A disk of bone was removed over the cyst, and an osteoid tumor, growing inward to the depth of half an inch, being discovered, was also removed by a second application of the trephine. Nine bone grafts were placed over the defect, catgut inserted, and the wound closed. The wound healed in twelve days. Two days after operation the patient began to move her arm. At the time the report was made improvement in the use and nutrition of both paralyzed limbs was progressing.

RE-IMPLANTATION OF DISK OF BONE AFTER TREPHINING.

Burrell⁹⁹_{Mar. 29} has had an excellent opportunity to corroborate the correctness of Macewen's assertion that completely detached fragments of bone, when re-implanted after the operation of trephining, not only retain their vitality, but likewise take an active part in the subsequent process of repair, by a case that recently came under his observation. The trephining was an exploratory one, done on a boy, aged thirteen, to determine the presence or absence of a depressed fragment of the internal table of the skull, that might have accounted for a group of existing cerebral symptoms. No fracture was detected and no abnormal appearance of the dura mater was found. The brain was explored to the depth of four inches with negative result. The disk of bone, which had been preserved in an antiseptic solution, was then carefully replaced and the soft tissues over it united by a fine, continuous catgut suture. Drainage of scalp-wound by catgut threads. Primary union under one dressing. The child's cerebral symptoms gradually grew worse, and he died eight months after the operation. On examining the skull it was ascertained that the button of bone had become firmly united with the circular margin along its entire circumference (Figs. 5 and 6) and was perfectly in position. The

implanted disk was a little whiter than the surrounding bone, but in all other respects it had the structure of healthy normal bone. Meninges of brain at site of operation presented a normal appearance. Macewen recommends that the button of bone removed should be divided into a number of pieces and the fragments planted upon the dura, but this case seems to prove that even a large disk of bone removed with a trephine can be successfully re-implanted.

TREPHINING FOR ENDOCRANIAL HÆMORRHAGE.

Ball² reports the case of a man, aged twenty-six, who had

been struck on the head with a pen-knife ten days before coming under observation. Aphasic symptom since the injury was received. This symptom, as well as the pain in the head, had increased the last few days. The puncture was indicated by a small scab over the squamous portion of the left temporal bone; when this was removed it was ascertained that the external wound had healed. When the patient replied to questions, he always used wrong words. He was also unable to write from dictation, or to write sentences which he composed. No paralysis of any voluntary muscles. Five days after his admission into the hospital the symptoms became so serious that it was

FIG. 5.—OUTER SURFACE.

FIG. 6.—INNER SURFACE.
RE-IMPLANTATION OF A TREPHINE BUTTON OF
BONE.
(*Boston Medical and Surgical Journal*)

decided to trephine. On reflecting the soft parts in the usual manner in the form of a flap a punctured wound was found in the underlying bone. A medium-sized trephine was used, and after removing the disk of bone it was seen that the knife had penetrated the

dura mater and brain. In enlarging the wound in the dura mater the posterior middle meningeal artery was divided, which gave rise to troublesome hæmorrhage. A sinus forceps was gently passed along the track of the brain-wound and the blades separated, when fragments of a blood-clot escaped. The cavity in the brain was cleansed by a stream of weak sublimate solution. A drain was introduced and the external wound closed. Great improvement the same evening, as the patient could talk with very few mistakes in the selection of words. Next morning he was more aphasic, and it was found that the drain had become blocked. Retained blood was removed, which was followed again by prompt improvement. After this the progress to complete recovery was uninterrupted. The author believes that the knife penetrated the superior temporo-sphenoidal convolution, traversed the fissure of Sylvius, and probably injured Broca's convolution, and that his symptoms were due to a blood-clot in the fissure of Sylvius, which was breaking down, and which was evacuated by timely surgical operation.

Davies-Colley's⁶ case was a carman, aged fifty-three years, who, when driving a van, fell down a distance of twelve feet, striking the side of his head. He was insensible at the time, but soon recovered consciousness. Slight paralysis of the left arm followed, which in the course of an hour had become complete, and slight loss of power in the left leg and side of the face. At the end of ten days the symptoms had become greatly aggravated. He was passing his evacuations involuntarily; was very drowsy, with slow and weak pulse; temperature below 97° F. (36.11° C.) and low delirium. On the eleventh day the skull was trephined just in front of the middle of the right fissure of Rolando. Underneath the bone a large clot was found which was removed partly with the finger and partly by irrigation with sublimate solution. There was no suppuration and the patient recovered rapidly. On the seventh day he was worse again. This was found to be due to the pressure of the dressing, for on changing this the symptoms disappeared. The paralysis disappeared completely and permanently. Mr. Jacobson has only been able to find ten successful cases of trephining of the skull for hæmorrhage during the last one hundred years.

Stoker² observed a man, fifty years of age, who was received into the Richmond Hospital four days after he had fallen from a

cart and sustained such injury that he became insensible. When he saw him first he was in a state of stupor, with complete paralysis of left arm and partial paralysis of facial nerve on same side. Noticeable paralysis of left leg. Sensation normal; pupils unchanged; contusion over right fissure of Rolando. On the ninth day the man was in a moribund condition. Left hemiplegia complete. Operation was postponed so long, as it was difficult to say whether the symptoms were due to contusion or hæmorrhage. As death was inevitable, an exploratory trephining was made at this time. As the patient was comatose no anæsthetic was used. The trephine was applied at the seat of contusion, as a possible fracture could not be excluded. A trephine with a diameter of twenty-six millimetres was applied and the removal of the disk of bone disclosed the margins of a blood-clot. A second button was removed immediately below and in front of the first which fully exposed the clot. In the centre the clot was so thick that the dura mater was separated from the bone about forty millimetres. The patient moved the paralyzed limbs before he was taken off the operating-table. The evening of the day of operation the paralysis and brain symptoms had all disappeared. The patient made a rapid and complete recovery.

A female, aged twenty-six, was admitted under the care of Croft⁶_{Dec. 24, '97} in a semicomatose condition. She was supposed to have been knocked down and kicked by a horse. Scalp-wound behind and below the left parietal eminence. No evidence of fracture. During the night she became comatose, and in the morning had complete hemiplegia on right side, but no paralysis of face. The skull was opened in the situation of the wound and about two and a half ounces of blood which had accumulated between the bone and dura mater escaped. Hæmorrhage had occurred from a vessel of the dura mater. As the bleeding continued it was arrested by means of pressure. After six hours the coma and paralysis commenced to disappear. Two days later speech returned. At the time the report was made she was in a fair way to recovery.

Walker,¹⁹_{June 9} trephined a man, thirty-five years of age, five days after he had received a supposed injury of the skull. The man was found in a comatose condition with partial left hemiplegia. A careful examination of the head revealed no external injury. As

the paralytic symptoms continued to increase and the coma became deeper, it was decided to explore the motor area on the opposite side of the skull. The head was shaved and thoroughly disinfected. Before operating the motor area was located by mapping out the head with aniline ink, first drawing A (Fig. 7), auriculo-bregmatic line, and at right angles with this line, D, the fronto-lambdoidal line; then measuring posteriorly two inches and drawing another line parallel with it would give a space in which is found the fissure of Rolando 3-3. At the time of operation left hemiplegia was complete, pulse thirty-eight, and temperature normal. The pupils responded feebly to light. On removing the first button of bone (2) a blood-clot protruded from the opening, and to enable a more thorough removal of extravasated blood another button (1)

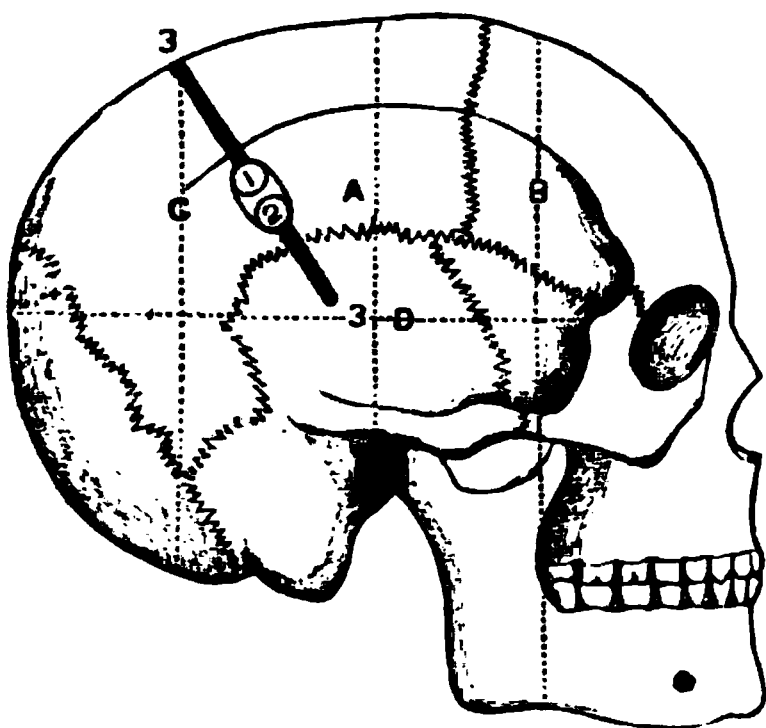


FIG. 7.

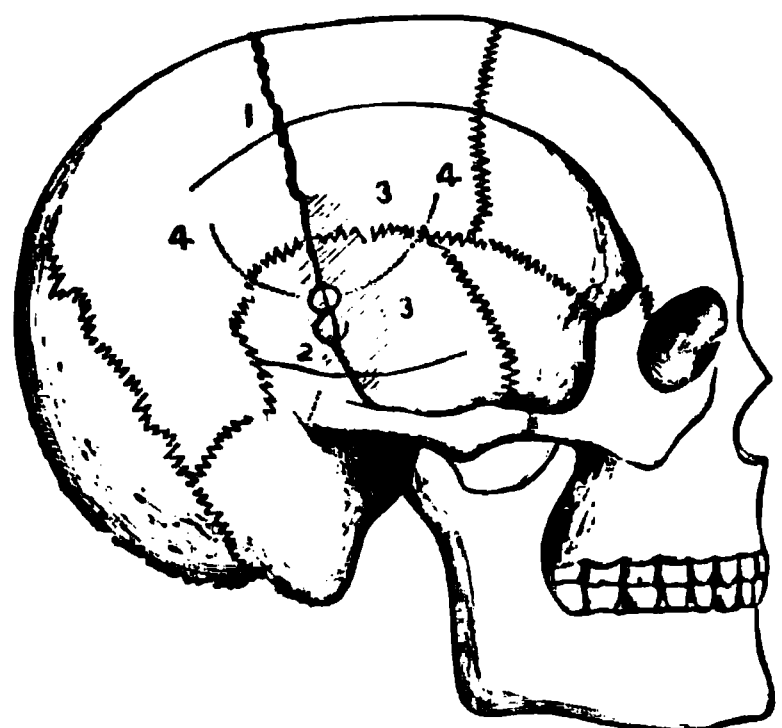


FIG. 8.

(*Medical and Surgical Reporter.*)

was removed. The two openings were made into one by using the chisel. Four ounces of blood were removed. Cavity between dura and skull was irrigated with one to one thousand solution of sublimate packed with a strip of iodoform gauze. Bone disks not replaced; and wound sutured. Improvement was noticeable soon after the operation was completed. Four weeks later the wound had closed and the paralysis had completely disappeared. After consciousness returned he remembered that on the day he was found unconscious on the street he jumped down from a scaffold that was giving way, a distance of ten feet. He continued to work for three hours, but while going home he observed that he could not hold his dinner-pail in the left hand, and shortly after this had no further recollection of anything until the morning following the operation. The same

surgeon reports another case in a child, eleven years old, where he was forced to resort to the trephine to relieve compression of the brain caused by a depressed fracture of the skull and a subdural blood-clot. The child fell from a building, striking upon the head; unconsciousness an hour after the fall. During night vomiting, delirium, and loss of speech. Secondary hemispasm of left arm, which on third day was followed by complete left hemiplegia. Vision was imperfect, complete aphasia; pulse, ninety; temperature, 102° F. (38.88° C.). The same day trephining was done, exposing the skull by a curved incision, with concavity toward parietal eminence, as indicated in Fig. 8 by dotted line (4-4). In order to fully expose the depression which was found (3-3) the incision had to be extended downward. Removing two half buttons (2) with the trephine, the depression could be lifted into place with the elevator. The dura mater appeared congested and under it extravasated blood could be seen. The dura was incised, the coagulum removed and the space irrigated with one to one thousand sublimate solution. The dural wound was closed with catgut sutures, drainage being secured by inserting a few strands of catgut. On the second day patient had two slight convulsions; at the same time spasm of the arm and hemiplegia were less. Complete recovery in the course of three weeks.

Enrique de Arcilza²⁶ operated in a case where the middle meningeal artery had been ruptured, and where an enormous clot caused dangerous compression of the brain, which must soon have been fatal but for prompt operative interference, showing how in traumatic apoplexy life may be frequently saved by boldly opening the skull and removing a coagulum without that fear of secondary hæmorrhage which too often restrains the surgeon's hands. The injury was caused by a blow upon the head. He soon became unconscious and remained so for five days, when the operation was performed. At this time he moved the legs and left arm incessantly; the right was passive, but not paralyzed. Injury in left temporal region. After incision a fracture could be felt, with great depression of fragments. With gouge and cutting pliers fragments were removed, exposing a large clot of blood between the skull and dura. The point of greatest compression corresponded to Broca's convolution, the third inferior frontal, and the ascending parietal. No further hæmorrhage. Prompt recovery.

Macewen, ⁶_{Aug. 11} in his masterly address on "The Surgery of the Brain and Spinal Cord," delivered before the last meeting of the British Medical Association, gives an account of a number of cases where he performed trephining for lesions caused by endocranial hæmorrhage. In 1879 he treated a boy who had a fall six days previously, which occasioned some slight bruises about the face and head, accompanied by a shade of mental obscuration. At the end of forty-eight hours he was so well that he wished to leave his bed. On the sixth day he had a series of convulsions, the twitchings beginning in the left side of the face, gradually involving the left arm, and subsequently the left leg, during which consciousness was not lost. Paresis of the parts remained, though sensation was unimpaired. The next day convulsive movements returned in the same order, but persisted and finally became general, with loss of consciousness. The motor

phenomena indicated a lesion on the right side of the brain. The symptoms pointed to the presence of an irritant, as a spiculum of bone driven into the brain, or a degree of pressure exercised on the surface. As the motor symptoms presented a sufficiently clear guide to the localization

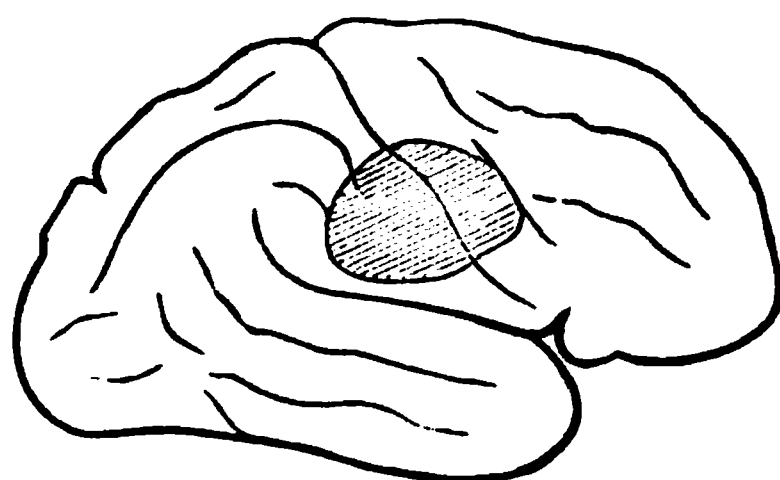


FIG. 9.
(*London Lancet.*)

of the lesion in the lower part of the ascending convolution, it was resolved to expose that portion of the brain. When the skull was exposed, a fissure was discovered running across the coronal suture. The trephine was applied at a point slightly behind the auriculo-bregmatic line and midway between the external auditory meatus and the vertex (Fig. 9). This point happened to correspond to the posterior extremity of the fissure. The dura was dense and presented a dark color. The dura was incised and about two ounces of fluid and coagulated blood escaped. The patient made an uninterrupted recovery.

In May, 1883, Macewen correctly diagnosed a traumatic intracranial effusion of blood as being located over the base of the ascending convolutions (Fig. 10). There were no marks of external injury, and the motor symptoms alone were the guides to the position of the lesion. The patient is, at the present time, in

robust health, and regularly at work. A few months later in the same year Macewen again diagnosticated correctly a brachial monoplegia, a focal lesion being found in the white substance of the motor cortex of the middle portion of the ascending convolutions (Fig. 11). The lesion was an extravasation of blood into the brain, around which encephalitis had occurred, inducing irritation and compression of this area. The relief which the operation afforded was immediate and complete. The patient has since been in perfect health and regularly at work.

Duponchel,³ in commenting on a fatal case of traumatic subdural hæmorrhage, asserted that death in such cases is produced by compression of the brain from the quantity of blood extravasated, or later by such compression plus the inflammatory products. He is in favor of operating eighteen to twenty-four hours after the

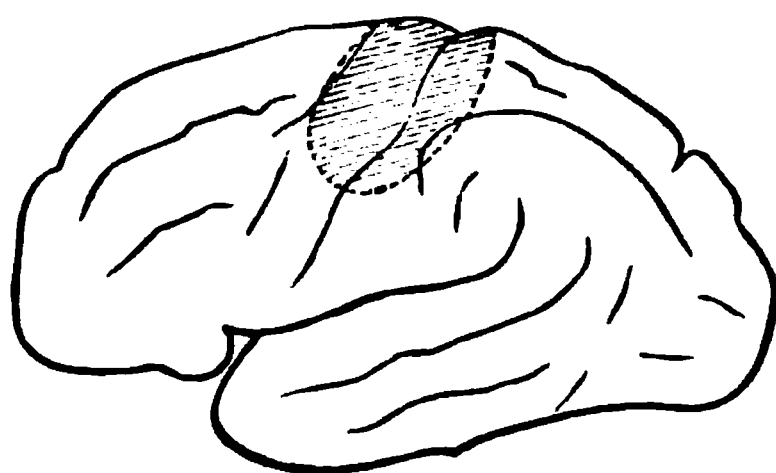


FIG. 10.

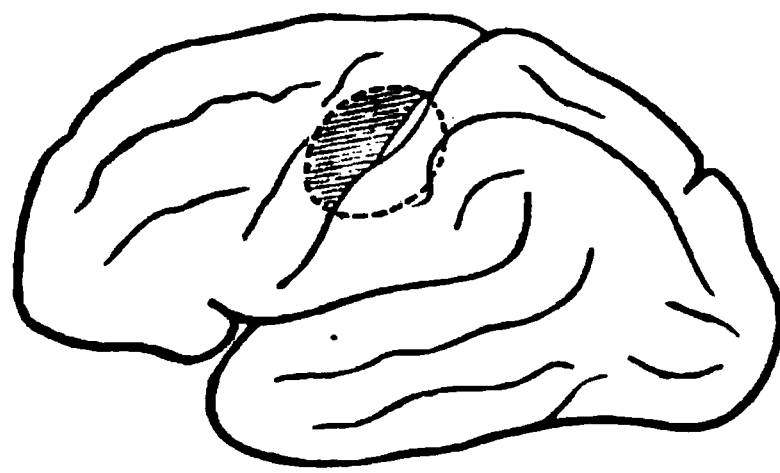


FIG. 11.

(*London Lancet.*)

hæmorrhage has occurred. As the most reliable symptoms he enumerates paralysis, epileptiform convulsions, and muscular spasms on the opposite side of the body.

Holger Mygind, of Copenhagen, corresponding editor, reports two cases of trephining of the skull in the practice of Bondesen. In the first case, that of a man, aged twenty-eight, who had fallen from a considerable height, the operation was performed two and a half hours after the accident. Hæmorrhage from the middle meningeal artery was diagnosed. No external fracture of skull could be detected, and none was found at the operation. The patient died during the operation from collapse. The post-mortem showed that the diagnosis was correct. The second case was a man, thirty-nine years old, suffering from a compound fracture of the skull caused by a gas explosion, a large piece of glass having penetrated the bone and entered the brain. The patient recovered.

In a paper on "Cerebral Surgery," by Damar Harrisson,¹⁸⁷_{July} reference is made to two cases of trephining for endocranial hæmorrhage. The first case came under the care of Mr. Howse. The patient, who was ten years of age, fell six feet upon the left side of the head. Conscious until six and a half hours after accident, then passed into a state of coma; unequal pupils, left more dilated than right, and not sensitive to light; limbs all rigid; right leg and arm convulsed; swelling of all the left side of head; respirations at times stertorous; pulse irregular, seventy-eight. Trephined two inches above left ear; no fracture exposed by operation. Removal of bone disk followed by escape of a black mass of blood-clot, with considerable bleeding, which was not controlled by pressure. Wound sutured, ice applied to head, and digital compression to common carotid for three hours. Bleeding ceased. The patient became conscious the next day. Recovered and left the hospital with hemiplegia and contraction of the limbs on right side, which Howse attributed to thickening of the dura and arachnoid, causing compression of the left motor area.

The second case came under the observation of Mr. Swaine. The patient, fourteen years of age, fell from a veranda two stories high, pitching on her head; picked up insensible. No external wound; large, fluctuating swelling over left parietal bone; no paralysis; respiration normal; pupils dilated. Three days after fall right pupil dilated and left contracted. Temperature rising and coma increasing. Incision exposed extensive fracture of the left parietal bone. Posterior part of bone depressed. Part of depressed fragments removed and the balance lifted into place. A large blood-clot found between dura and bone was removed. Considerable hæmorrhage took place, which was arrested by the actual cautery. Early signs of improvement after operation. A week after operation quite conscious and had recovered speech. Later, perfect recovery.

Fröhlich³⁴_{Apr. 1} reports a case of rupture of the middle meningeal artery resulting from a blow with a cane against the left temporal region. The patient, who was seventeen years of age, with the assistance of a friend was able to walk for an hour and a half after the receipt of the injury. When he arrived home he was attacked with nausea and vomiting, followed by delirium and coma, and died in five hours. At the post-mortem a red spot two centimetres

in length was found in the left temporal region. No fracture. On removing the top of the skull a blood-clot twelve centimetres in length, eight centimetres in width, and four centimetres in thickness was found between the skull and dura. After removal of the clot the middle meningeal artery was found lacerated and the central end plugged with a coagulum. The brain at a point opposite the blood-clot showed all the indications of compression. This case affords a good illustration of the importance of resorting to trephining as soon as symptoms of compression arise in all instances where, from the history of the case and the site of the injury, it is probable that the middle meningeal artery is the source of hæmorrhage.

In Brunner's case,²⁴ the middle meningeal artery was lacerated and the seat of a copious hæmorrhage, but the fracture was compound, consequently cerebral compression did not occur. Loose fragments of bone were removed. The dura mater showed a tear two centimetres in length, through which the brain protruded. As hæmorrhage continued from the lacerated middle meningeal artery this vessel was ligated and the wound packed with iodoform gauze. A few days later the tampon was removed and the wound united. The patient made a satisfactory recovery.

Landenberger,¹⁰⁵ treated a case of injury to the head with fracture of both legs in a boy seventeen years of age. No fracture of skull, but the general as well as the focal symptoms indicated the existence of cerebral compression. Trephining was done eight days after the injury at a point corresponding to the place where a few days before a pericranial abscess had been opened. On removing a disk of bone dark-colored blood and about a tablespoonful of pus escaped. Notwithstanding that one of the injured legs had to be amputated at the same time, as gangrene had set in, the patient made a satisfactory recovery.

Brunner,²¹⁴ reports several cases of rupture of the middle meningeal artery from the clinic at Zurich. The first case was a man, thirty years of age, who was the subject of a compound fracture of the skull, caused by direct violence, with laceration of middle meningeal artery and contusion of the brain. The patient never lost consciousness, and all of the symptoms were slight when compared with the gravity and extent of the injury. In the right temporal region was an irregular, lacerated wound, through which

arterial blood escaped freely. After the head was shaved and thoroughly disinfected the wound was examined with care. For this purpose the external wound was enlarged, which was followed by escape of brain substance; the index finger readily entered the skull through an irregular opening in the bone. Dura mater lacerated; eight detached fragments of bone were removed. The depressed fragments were elevated. The whole wound disinfected with a one to one thousand solution of sublimate. The lumen of the lacerated, bleeding middle meningeal artery could be distinctly seen in an open canal of the bone. The bleeding was arrested with a tampon of iodoform gauze. Drainage and suturing of the wound. Uninterrupted recovery. Patient remained in perfect health two years after the injury.

The second case was a laborer, twenty-seven years of age, who was struck on the head by an unknown person. The patient was unconscious from the beginning. Pupils of medium size, react slowly. Paralysis of left facial nerve, complete paralysis of right arm, and incomplete paralysis of right leg. In left temporal region a wound six centimetres in length from before backward. After the head was shaved and well disinfected, search was made to ascertain the extent of the injury. Extensive comminution of underlying bone. Defect in the bone the size of the palm of the hand. The loose fragments, eighteen in number, were extracted and the depressed portion elevated. The dura, which was found depressed, rose to its normal niveau. The anterior branch of the middle meningeal artery was lacerated and bled freely. After removing a portion of the margins of the bone with the chisel the bleeding point was made accessible to direct treatment. With a curved needle armed with a catgut ligature the vessel was ligated above and below the arterial wound. Disinfection with a one to one thousand solution of sublimate. The lacerated dura mater was covered with iodoform gauze and a copious antiseptic dressing was applied. Return of consciousness and disappearance of hemiplegia immediately after the operation. Discharged cured six weeks later.

In the third case the fracture was comminuted, but not compound, and as the middle meningeal artery was ruptured the hæmorrhage caused compression of the brain. The fracture was caused by a fall upon the head. The patient was conscious

immediately after the fall, but in a short time passed into a comatose condition. In this state he remained for thirty-six hours, when he was brought to the hospital. When admitted the pulse was fifty-six to sixty, full, but intermittent. Respirations, on an average, ten, and had assumed the type of Cheyne-Stokes. Pupils dilated, responding slowly and imperfectly to light. Paresis of right facial nerve. Left temporal region swollen and œdematous. Two small, superficial wounds; hemiparesis on right side. A positive diagnosis was made of rupture of the middle meningeal artery on right side with extravasation of blood between the dura and bone. As the soft parts were reflected a fissure was detected running in a horizontal direction. The disk of bone removed showed a deep depression which had been occupied by the posterior branch of the middle meningeal artery. The anterior half of the round opening was occupied by the posterior margin of a dark coagulum. As it was certain that the greater mass of the coagulum was located anteriorly to the first opening, the soft parts were reflected in this direction, and it was now discovered that the greatest amount of bone injury existed here. A loose fragment which was removed showed two grooves of the principal branches of the artery. The coagulum was extensive and at the point of operation had separated the dura mater from the bone three centimetres. On removal of the coagulum one of the branches of the artery bled freely. The hæmorrhage was arrested with three catgut ligatures, which were passed through the dura and underneath the vessel with a curved needle. Coagulum was firmly adherent to dura mater, and on this account could not be completely removed. Dura itself not injured. The whole amount of the extravasated blood was estimated at two hundred grammes. Disinfection of the cavity with a one to one thousand solution of sublimate. Drainage and suturing of wound. The operation was not followed by any immediate improvement. The next day the patient was able to speak and the hemiplegia less marked. The symptoms continued to improve for two days, when he suddenly developed a pneumonia, which proved fatal on the next day. This case furnishes a typical picture of the characteristic and almost pathognomonic complexus of symptoms observed in cases of rupture of the middle meningeal artery when the fracture which has caused the rupture is not compound. If concussion or contu-

sion of the brain do not complicate the case the patient retains consciousness for a variable length of time after the injury, until the endocranial bleeding leads to stupor and focal symptoms which can be traced to compression of a circumscribed portion of the brain. It constitutes one of the triumphs of modern surgery that such cases can be saved by timely operative treatment. The operation aims at finding the seat of hæmorrhage, removing the blood-clot, and arresting further hæmorrhage by ligation, or, if this cannot be accomplished, by the aseptic tampon.

Owen² had under his care a boy, nine years of age, who was stunned by a fall from a cart. He was drowsy and only partially conscious. No fracture could be detected. Next day temperature was 101° F. (38.33° C.), and symptoms worse. After five days convulsions set in. The right facial and suprahyoid muscles were the seat of severe spasms. Had nine attacks during the day. The right facial muscles and right arm were partially paralyzed. The next day temperature was normal, pulse seventy-four, several severe convulsions. The flexors of the right wrist and fingers contracted violently about ninety times a minute. The boy did not lose consciousness during the fit, but he could not speak. A blood-clot over the left fissure of Rolando was diagnosticated. The position of the clot was marked on the wet, shaven scalp with an aniline pencil. A one-inch disk of bone was removed, exposing the dura, which bulged into the opening and presented a greenish color. When the membrane was incised a considerable quantity of dark fluid blood escaped, and the upper border of a clot was exposed at the lower part of the incision. Another disk was removed in this direction, and after enlarging the incision in the dura the clot was removed. (See Fig. 12.)

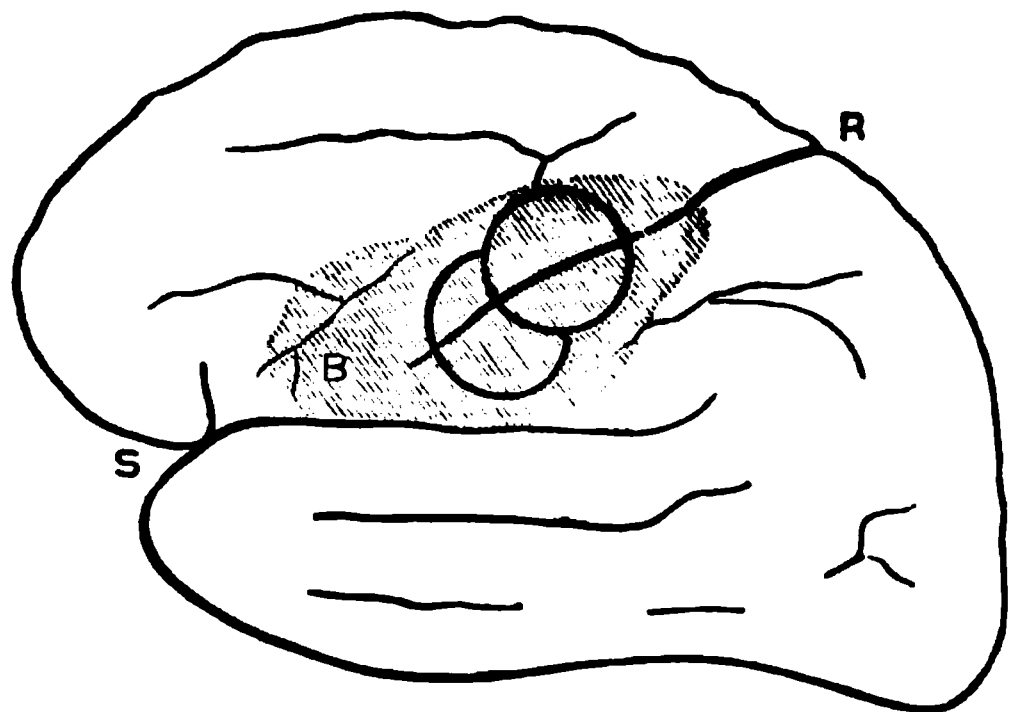


FIG. 12.—CONVEX SURFACE OF LEFT HEMISPHERE.
R, fissure of Rolando; S, fissure of Sylvius; B, Broca's region. The shaded part shows the area of the clot, and the circle and the half-circle indicate the trephine wounds.
(*British Medical Journal.*)

The clot was estimated a half a fluid ounce. Disinfection by

washing out the subdural space with a solution of carbolic acid, which was made to flow in through an elastic catheter. Dura sutured, external wound drained and closed. Immediate improvement. The next morning another convulsion. A few slight convulsions during the next two days. After that time gradual improvement, resulting finally in a permanent cure.

OPERATIVE TREATMENT OF TUMORS OF THE BRAIN.

During the last year two valuable papers on brain surgery have appeared by American surgeons. McCann¹⁶¹_{Oct.} read a paper on "Observation on the Present Status of Brain Surgery" before the Pennsylvania State Medical Society, June 7th. Park¹_{Nov. 3, 10, 17} read a paper on "Surgery of the Brain, Based on the Principles of Cerebral Localization" before the Congress of American Physicians and Surgeons at its first meeting, Washington, September 19th. These papers reflect credit upon their authors and should be read in the original by all who are interested in cerebral surgery. It must be a source of pride to the profession of this country that during the last year a number of the most brilliant results of cerebral surgery have been reported by American surgeons. Keen⁵_{Oct.} reports the successful removal of a large fibroma of the brain. The patient was a carriage-maker, twenty-three years of age, with a good family history, who at the age of three fell out of a window, a distance of several feet, striking his head upon some bricks. There was no external wound. He remained comatose for an hour. The recovery from the injury was slow but apparently complete. At five, a discharge from the right ear followed an attack of measles. It has continued at intervals ever since and has impaired his hearing. His health was good, excepting the frontal headaches, which were moderately severe. In the fall of 1884 he became ill with neuralgic pains. These symptoms gradually increased until February, 1885, when he was seized with violent epileptic attacks, followed by intense pain in the head which lasted several days. The fits occurred once or twice a week and the attacks of pain in the head increased in severity and duration. By the end of April the right arm, the right leg, and the right side of the face became paralyzed in the order named, the paralysis making gradual progress. By June, 1885, the pain in the head was excruciating and was located on the left side of the head, and

started about the supraorbital ridge, darting back to the occiput, but was more intense at the middle of the left side of the head. At this point a small scar was detected. Pressure increased the pain. The entire right side of the face was paralyzed. Both motion and sensation were affected, though motion had suffered more than sensation. Right pupil dilated and responded feebly to light; response of left pupil more prompt. Sight of left eye the better. Aphasia this time a prominent symptom. Pulse sixty and irregular; respiration sixteen. Treatment did not produce any influence, and the symptoms gradually became more serious. In May, 1887, when first seen by Dr. Keen, the gait showed but slight paralysis; grasping power of both hands somewhat unequal. Right eye deviates slightly upward and outward, whilst the left turned directly in. The skull feels slightly irregular, as if the bone had been injured; no marked depression; not now tender or painful, nor is there any sensation located at this point preceding the fits. Epileptic attacks frequent, one of which was carefully examined and showed a well-marked right-sided seizure. Ophthalmoscopic examination by Dr. Oliver showed characteristic appearances of previous choking in both disks.

Fields of vision gave the following results: Left-sided homonymous hemianopsia, superadded to large central scotomata, leaving two irregularly contracted right-sided fields, in which nothing but form could be discerned (Fig. 13). These fields were obtained with a McHardy perimeter in the ordinary way, except that the patient was made steadfastly to fix his eye upon the central point by means of a continuous noise (tapping with a pencil-tip upon the central white button), the act being rendered more sure by an assistant who continually watched that the eyeball was not moved. The surgeon's finger was carried in different directions along the perimeter arc, and, when first recognized, the registry was taken. The temperature over the scar was 95.5° F. (35.26° C.), and in a corresponding position on the right side 94.4° F. (34.6° C.).

The most careful preparations were made for the operation, which was performed December 15, 1887. An incision was made through the scar down to the bone. By a gouge a little nick was then made in the bone so as to fix the site of the scar. A large semi-elliptical flap was then cut three and a half inches across in both directions. All hæmorrhage was arrested as it

occurred. A one and a half inch trephine was then applied so as to include the site of the scar, the lower edge of the trephine just

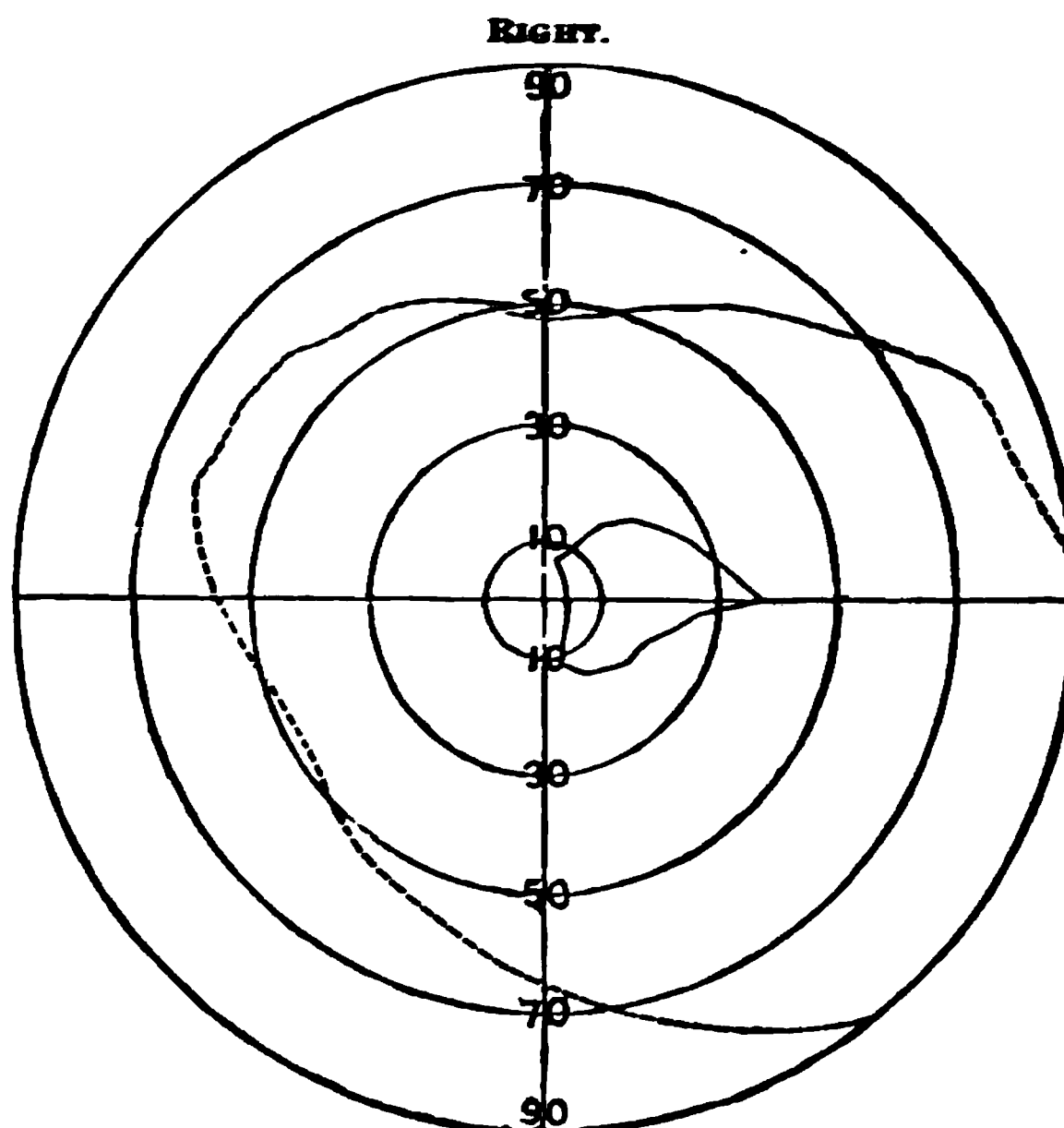


FIG. 18.

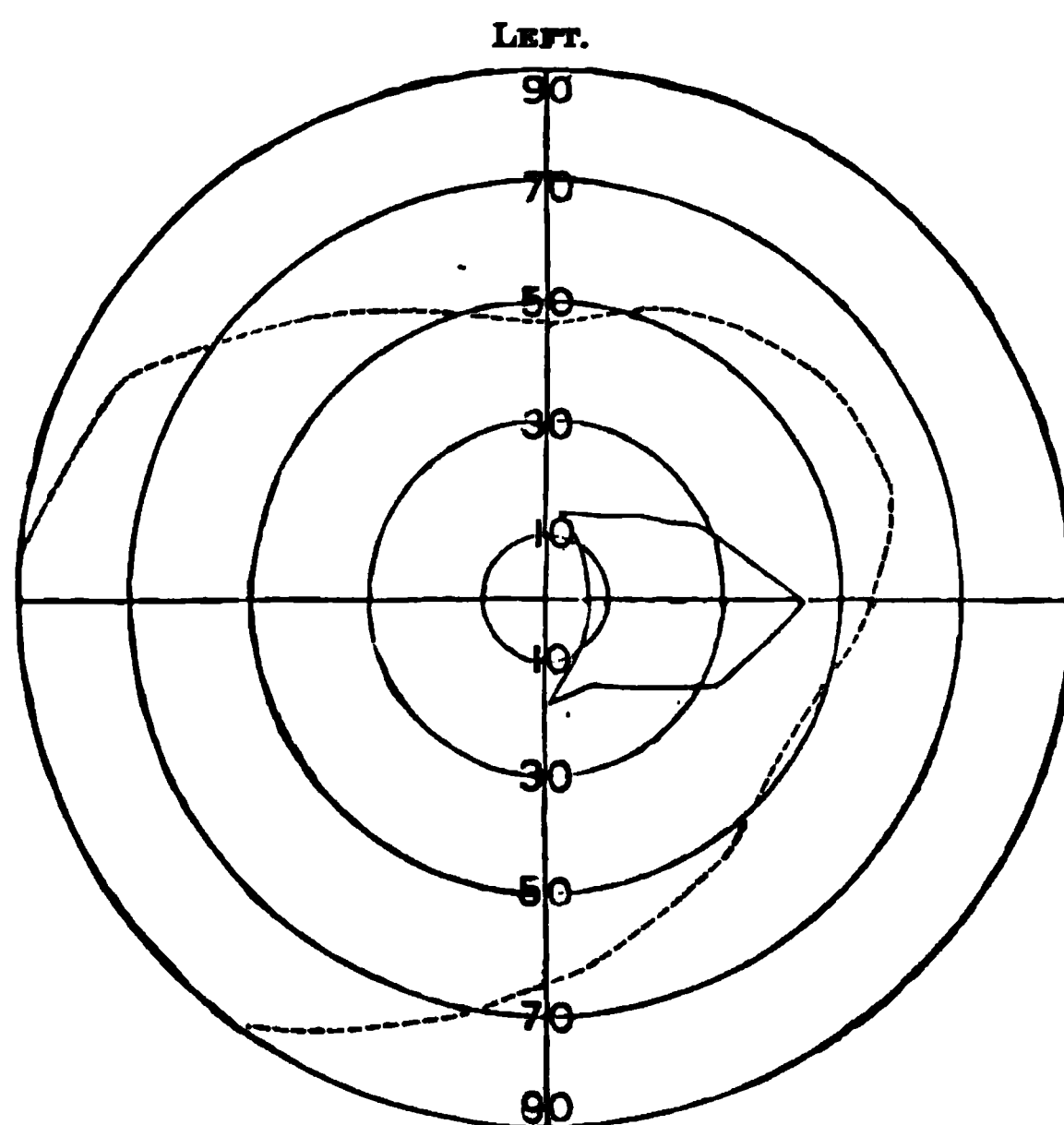


FIG. 14.

(*American Journal of the Medical Sciences.*)

including the temporal ridge. Dura mater adherent to the bone. When this membrane was exposed, it was found to be covered with a velvety outgrowth one-sixteenth of an inch in thickness. A second button was removed directly posterior to the first. Dura did not bulge into the opening. Exploring needle came in contact with a firm mass in the substance of the brain. With rongeur forceps opening was enlarged to two and a half inches transversely by three inches antero-posteriorly. The upper margin reached to within three-quarters of an inch of the middle line, when the border of the tumor was fully exposed. The lower border of the

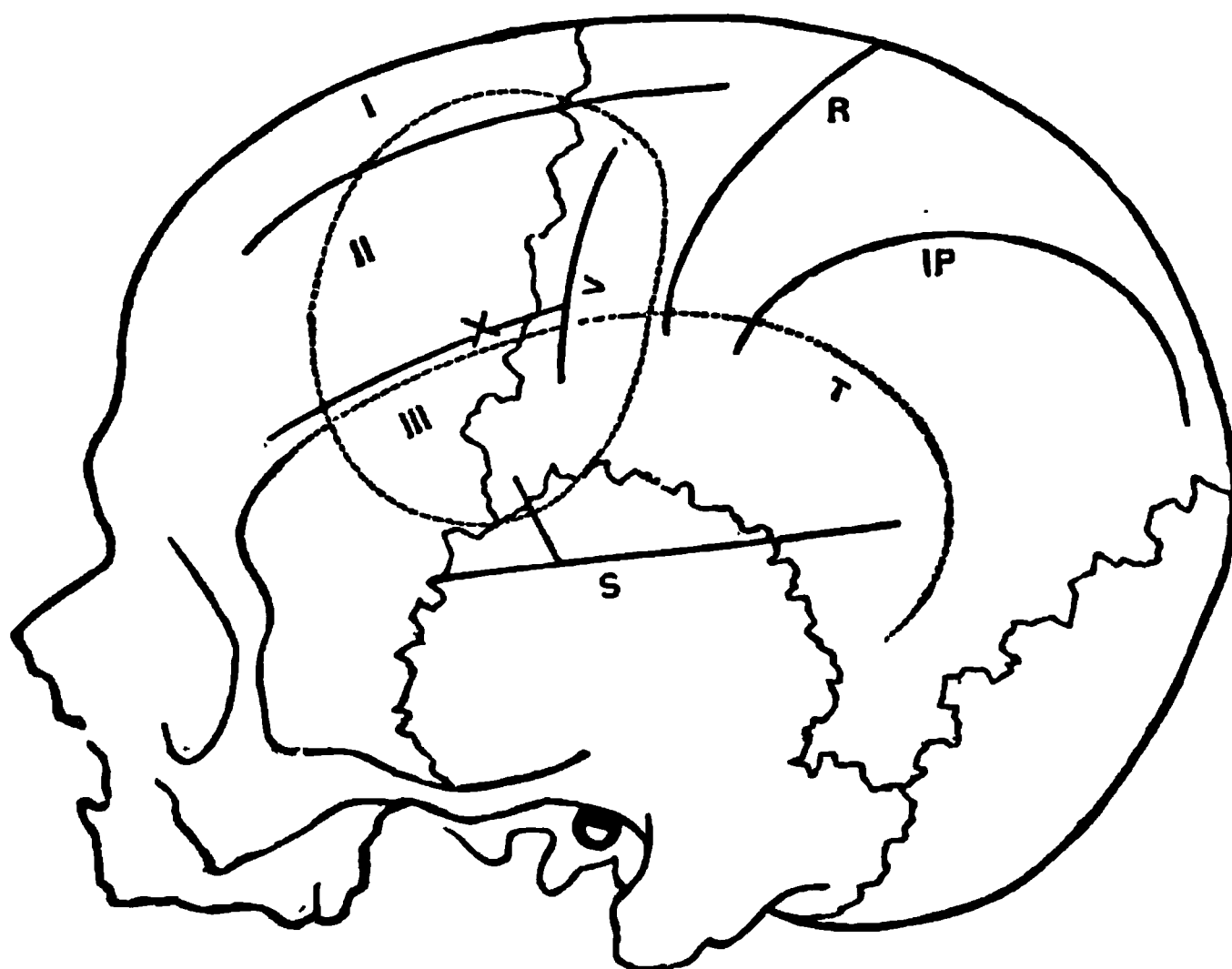


FIG. 15.—DIAGRAM OF THE SKULL SHOWING THE SITE OF THE TUMOR.
S, fissure of Sylvius; R, fissure of Rolando; IP, intraparietal sulcus; V, vertical or precentral sulcus; T, temporal ridge; I, II, III, the first, second, and third frontal convolutions. The oval dotted line represents the tumor, the cross (X) the site of the scar.

(*American Journal of the Medical Sciences.*)

tumor dropped behind the squamous portion of the temporal bone. On incising the dura one-quarter of an inch from the edge of the bone it was found to be adherent to the subjacent mass slightly at the margins, but increasingly so toward the site of the scar as a centre (Fig 15).

Enucleation of the tumor was not attended by any difficulty, but there was free hæmorrhage. The tumor weighed three ounces and forty-nine grains. Size, two and seven-eighths by two and a half inches and one and three-quarters inches in thickness; seven and a quarter and six inches in circumference in the two axes (Fig. 16).

The tumor intimately attached to the dura but non-adherent to brain-tissue. On section it showed the structure of a fibroma.

FIG. 16.—APPEARANCE OF THE TUMOR WITH DURA ATTACHED. NATURAL SIZE.
(DRAWN BY DR. JOHN M. TAYLOR.)
(*American Journal of the Medical Sciences.*)

On microscopical examination the tumor was found to be a fibroma "showing a tendency toward an arrangement in bundles of fibrous elements. To the right in the drawing (Fig. 18) is a

FIG. 17.—DIAGRAM TO SHOW THE DEPTH OF THE TUMOR (DRAWN BY DR. S. C. WOOD).
The shaded part represents the tumor. The section is from "Dalton's Topographical Anatomy of the Brain,"
Series C, Plate VI
(*American Journal of the Medical Sciences.*)

transverse bundle of fibres having a peculiar translucent appearance as of some secondary degeneration."

Several bleeding veins of the brain were tied with catgut. The utmost gentleness had to be used in trying to avoid cutting the ligatures. After ligation the hæmorrhage was still profuse. The wound was therefore douched with hot water 115° to 120° F. (40° to 46.1° C.), and pressure by sponges was tried. The bleeding was thus finally controlled. The large cavity created by removal of the tumor was diminished at least one-half by the rising brain-tissue. Rubber fenestrated drains were introduced at two points and a bundle of horse-hairs was then carried from one opening to the other across the wound. The bone disks were not re-implanted on account of the loss of the subjacent dura mater.

FIG. 18.—MICROSCOPICAL APPEARANCE OF TUMOR IN SECTIONS. (DRAWN BY DR. ALLEN J. SMITH.)
(*American Journal of the Medical Sciences.*)

External wounds sutured and covered with a copious antiseptic dressing. The operation lasted nearly two hours; patient recovered promptly from its immediate effects and was perfectly conscious the same evening. Aphasia became somewhat marked. There was no paralysis. For a week the temperature varied from a little above to a little below 100° F. (37.77° C.). For two days the dressings had to be changed twice daily; on the third day a clot, which had formed and which was estimated at four ounces, disintegrated and gradually came away. The second week the symptoms were threatening. Temperature on the tenth day, 104.2° F. (40.11° C.); four days later, normal. On the eighth day the aphasia, which had nearly disappeared, began to increase

again. Tenth, paralysis of face and arm; speech defective. The wound was partially re-opened, but no pus was found. During the third week temperature was nearly normal. Slight hernia cerebri. In the fourth week another sharp rise to 102.6° F. (39.20° C.), yielding to antipyrin. End of fourth week he could move the right arm. During the fifth week again an increased temperature, which yielded to laxatives. At this time the hernia was covered with granulations, and as epidermization did not progress favorably skin-grafting was done successfully. At the end of six weeks the wound had completely healed, and instead of a protrusion a depression existed. Two months after the operation the fields of vision, which were again taken by Dr. Oliver, although retaining the same position and embracing the same area, were found to have gained partial color-definition. On the eighty-fourth day he went home well (Figs. 19 and 20).

At this time four millimetre squares of white, yellow, blue, red, and green were fastened in turn upon the carriage of the arc and wheeled in consecutive order into the areas of recognition. In the left eye, white gave the largest area inside of the original form field, followed by yellow and blue that occupied smaller, though seemingly similar, spaces. Red, which was termed "lead color," gave the smallest field, and was designated as "blue" throughout the blue field, before reaching its own area. Green was never recognized, being called "yellow" inside of the yellow field. No scotomata could be obtained throughout all of the areas. The field of the right eye showed a small area just inside of a very doubtful blind spot, in which yellow, red, and green were termed "bluish" or "blue;" blue being properly designated in these positions.

On April 19, 1888, he had a slight epileptic seizure, but otherwise was well and gaining flesh.

An exceedingly important and practical contribution to the surgery of the brain was published during the last year conjointly by Weir and Seguin,⁵ July, Sept. which contains in a condensed form nearly all that is known on that subject. The following remarkable case serves as a text for these papers:—

The patient was a brewer, thirty-nine years of age. No history of any venereal disease; was perfectly healthy until the autumn of 1882, when he suffered from an attack of malaria.

During this illness he had a good deal of pain in the head, and one day, feeling strangely, he had a spasm of the right cheek and

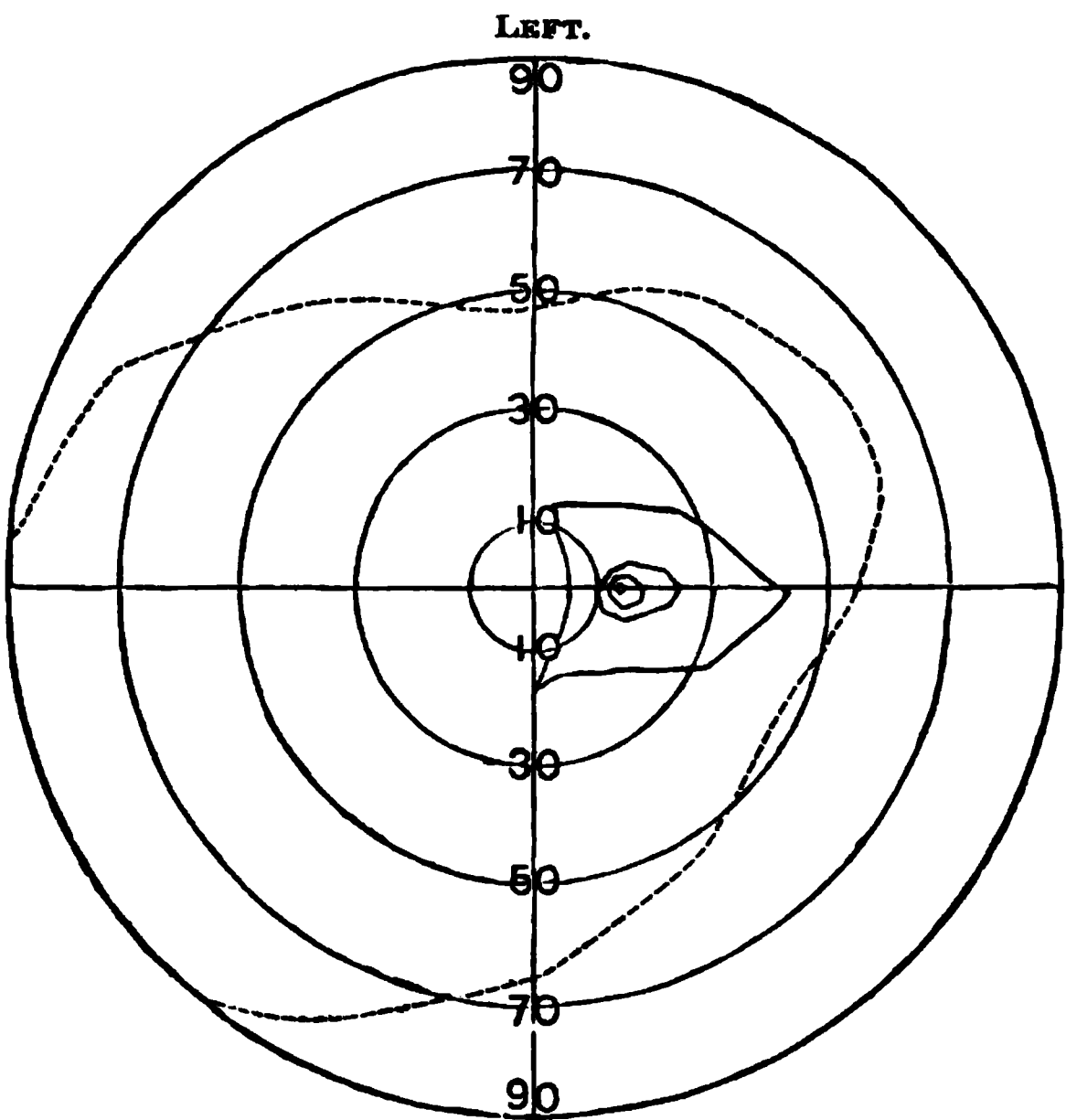


FIG. 19.

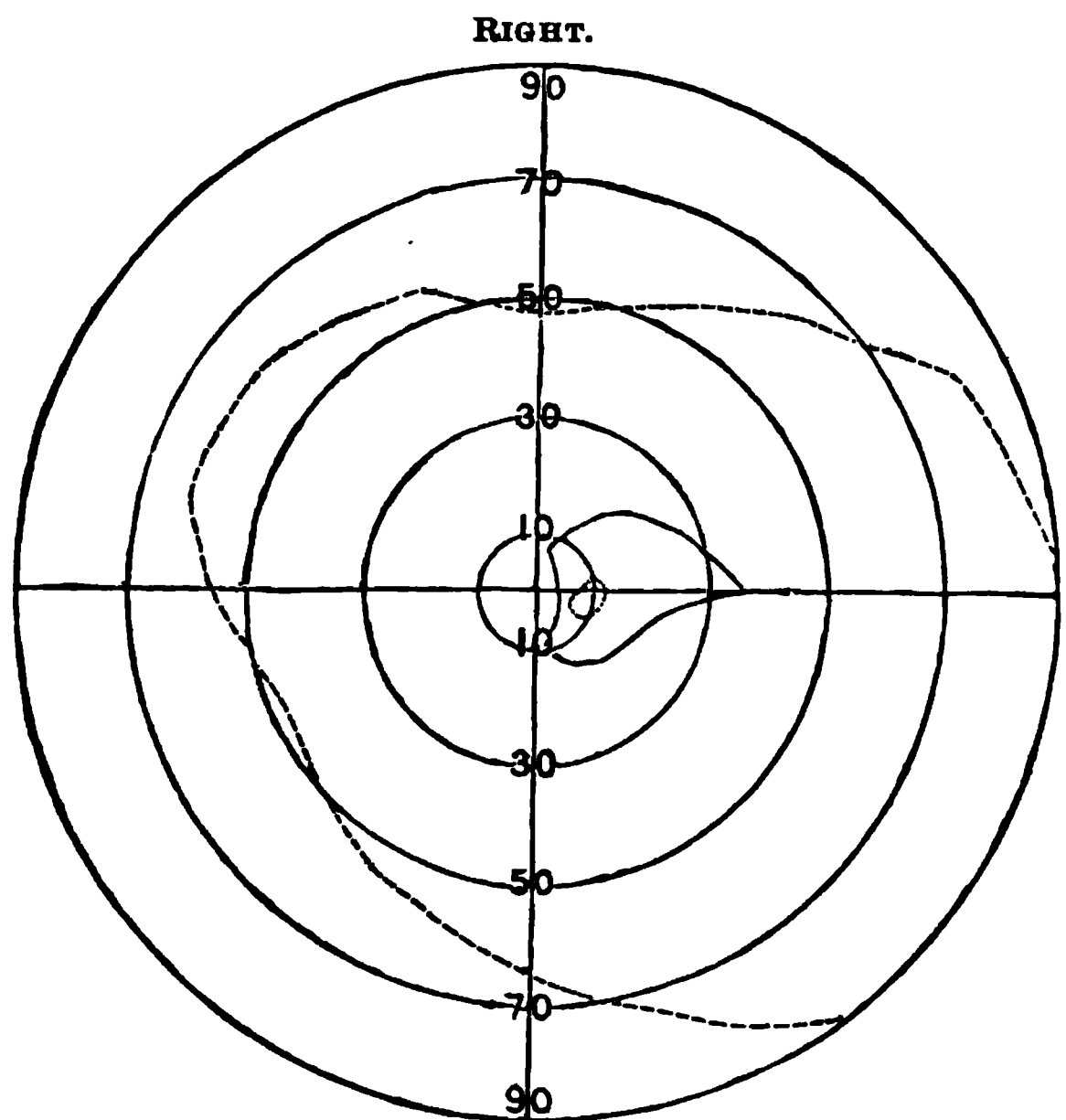


FIG. 20.

(*American Journal of the Medical Sciences.*)

neck. Patient did not lose consciousness, and the twitching spasm did not affect the arm. A similar attack occurred a year later, and during the third year he had an occasional attack in the night. He was otherwise well, with the exception of an occasional headache, until two years ago, when he fell unconsciously and bit his tongue. He has had similar attacks at long intervals since. These attacks were epileptic seizures and were preceded by an aura consisting of a "frightened feeling," followed by twitching or jerking in the right hand and arm and in the right side of the face, followed by loss of consciousness. August 26, 1887, Seguin made a careful examination, when he found that the facial muscles on the right side were distinctly paretic and there was slight deviation of the tongue to the right. Right arm paretic, walk normal. Mental action slow but accurate. Large doses of bromide had little, if any, effect in controlling the epileptic attacks.

Symptomatic Diagnosis.—Right-sided Jacksonian epilepsy, with facio-brachial paresis.

Anatomical Diagnosis.—Tumor of the left motor zone in the facial centre. As the patient was again suffering from malaria, Fowler's solution and quinine were added to the treatment with bromide. The following month he was again examined, as all of the symptoms had become aggravated. Pupils and optic disks continued to remain in a normal condition. The decision whether the tumor was cortical or subcortical could not be reached with certainty, as the spasms indicated its location in the former, while the absence of headache pointed to its location in the latter position. Large doses of iodide of potassium did not prevent a gradual aggravation of all the symptoms. In November of the same year another examination revealed tenderness on percussion, coinciding with the seat of greatest constant pain, in a spot just in front of the auriculo-bregmatic line, and from eight to ten centimetres above the external auditory meatus. The patient was now sent to the New York Hospital to be placed under the care of Weir for surgical treatment. Before the operation, the temperature was taken with a surface thermometer over the supposed seat of the central lesion and at a corresponding point on the opposite side on two different days, when on the first day it was found in the former place 1.4° F. (0.77° C.) higher; on the second day no difference of any moment was noted. In reference to the final diagnosis it was

surmised that the tumor was a subcortical sarcoma. The appended figure (Fig. 21) is a reduction of an Ecker diagram with the probable site of the tumor marked by a heavy ring, drawn before the operation, which was done by Weir November 17th. The tumor was found deeply under the surface of the brain in the indicated location. Although, surgically speaking, it was a subcortical tumor, yet it probably invaded the cortical gray matter deep in the sulcus between the gyri (Figs. 22 and 23). Operation by Weir November 17. The patient's head, shaved the previous day, had been for twenty-four hours covered with gauze moistened with one to sixty carbolic acid, after a thorough scouring with whale-oil soap and water. The auriculo-bregmatic line was marked out by Seguin on the scalp, and at a point a little in front of this line and just anterior to the lower half of the fissure of Rolando a minute perforation was



FIG. 21.
(*American Journal of the Medical Sciences.*)

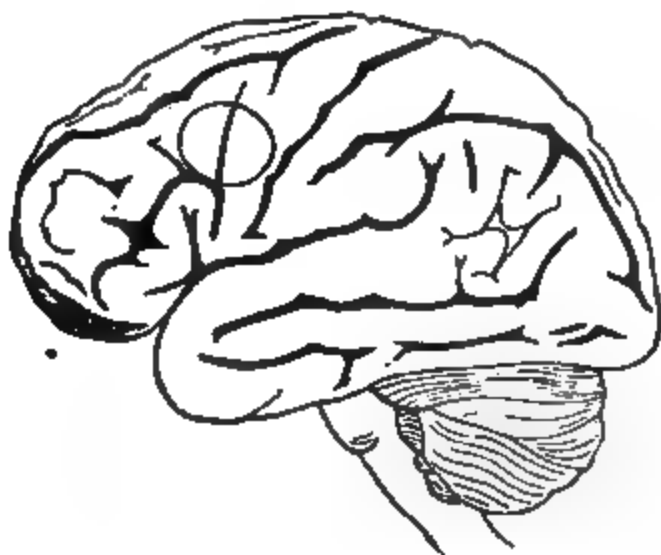


FIG. 22.

(*American Journal of the Medical Sciences.*)

FIG. 23.

made through the scalp, and through this a mark made with a sharp pencil to indicate on the skull, when exposed, the place to apply the trephine. An oval flap, three inches broad and including the periosteum, was then raised from the skull in such a way that its base was toward the frontal region, *a* (Fig. 24). The first button of bone with a one-inch trephine was removed about one and a half inches above

and a little in front of the left ear. With the same trephine another button was removed in front of and a little above the first. The dura bulged slightly into the openings made, but pulsated freely, and presented a normal appearance. An oval dural flap, with base upward, was made and reflected, *b*. One of the vessels of the pia was wounded in the procedure, and was ligated after some difficulty. The middle meningeal vessels crossing over the dura were secured, partly before and partly after incision of the membrane, by a curved needle, carrying catgut through the dura. Two branches that were bleeding were compressed with a sponge at

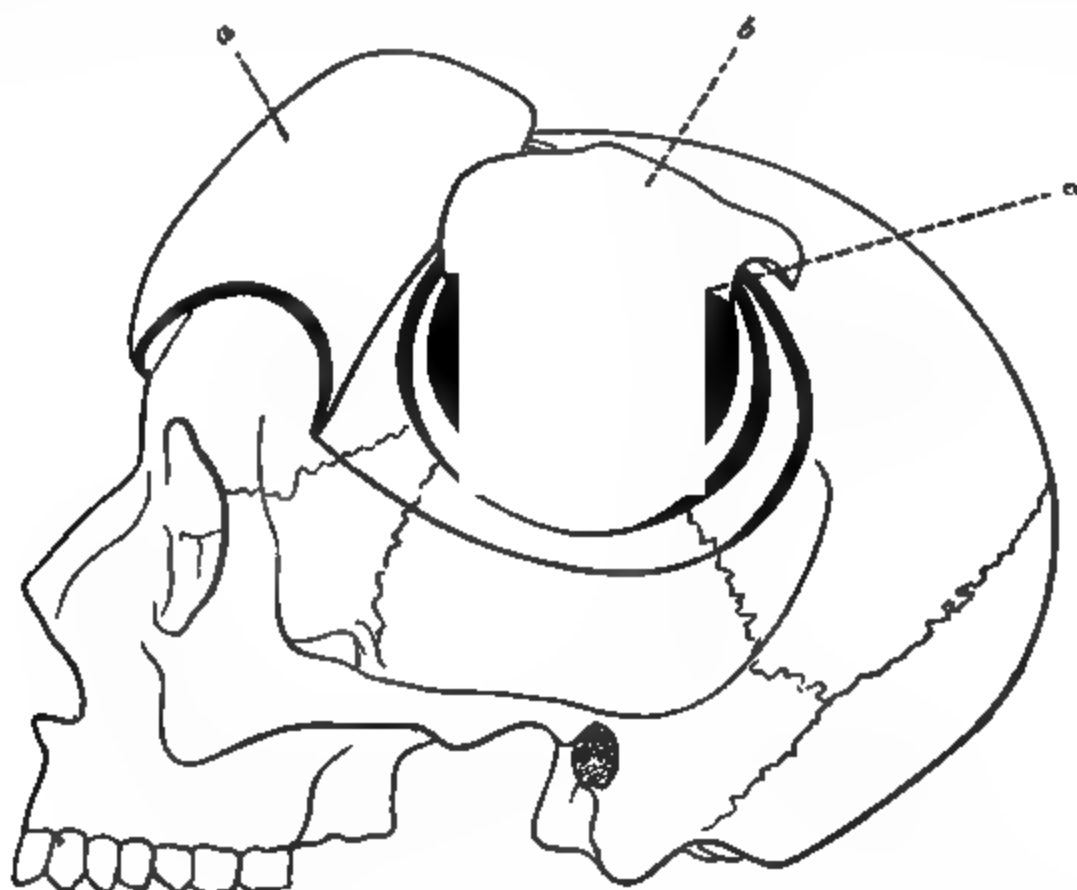


FIG. 24.—DIAGRAM SHOWING LINES OF INCISION AND LOCATION OF TUMOR.
(*American Journal of the Medical Sciences.*)

first and later by a tampon of iodoform gauze pressed between the dura and the skull. The exposed brain bulged, but its pulsations were manifest. The brain appeared normal and the finger detected no tumor or abnormality. Quite firm but gradual pressure, sufficient to permit the finger to be carried below the skull level and slightly beyond the area of the bone opening, revealed nothing. It began to appear as if the growth was beyond the reach of surgical art, when firm pressure posteriorly encountered a deep resistance of a hard mass of small size underneath the previously suspected convolution, *c*. The convolution was gently parted with the finger-nail and a director, and at a depth of

nearly an inch, directly inward and probably in close proximity to the upper part of the ventricle, a mass was exposed to the touch, and subsequently indefinitely to sight, by means of gently used retractors. It was then ascertained to be a growth nearly the size of a large almond, or, more correctly, in shape and size as large as the end of the forefinger, not encapsulated, and seemingly infiltrated into the brain-tissue. The tumor was readily lifted from its bed with a Volkmann's spoon one-half inch in diameter, which had been previously blunted for the purpose. After the tumor had been taken away a separate hard piece the size of a pea was detected and removed. No hæmorrhage from the brain occurred. The cavity on digital exploration was found to be lined with healthy brain-tissue. Rubber drain inserted to the bottom of the wound, dura stitched, and disinfection with a one to five thousand solution of sublimate. Both disks and a number of fragments removed with the *rongeur* forceps were re-implanted. Superficial drainage secured by capillary drains of horse-hair and catgut. At the place where the meningeal oozing was troublesome, iodoform gauze was tacked between the skull and dura. Antiseptic dressing with moderate pressure. The location of the tumor in depth is approximately represented by Fig. 23, made from an oblique transverse section, corresponding with the frontal section of Pitres.

The microscopical examination of the tumor corroborated the previous clinical diagnosis of sarcoma. The operation lasted about one hour and three-quarters, and when it was finished the patient's general condition was good; pulse one hundred and twenty-five. When the patient came out from under the influence of ether it was noticed that he moved his right leg well, and his arm as before. Slightly aphasic and facial paralysis increased. The next day restless; temperature, 102° F. (38.88° C.); respiration, twenty-four; pulse, one hundred and twenty-four; was given five grains of antipyrin subcutaneously. Third day, temperature, 100° F. (37.77° C.); pulse, one hundred and twelve; aphasia more marked. Fourth day, temperature, 99° F. (37.22° C.); pulse, ninety. Dressings changed and deep drain removed. From the fifth day the patient progressed favorably. A second dressing was made ten days after the operation, when the wound was healed with the exception of the drain channel. Aphasia nearly disappeared. Replaced bone firm. December 4th he was out of bed,

sitting up. The scalp was firmly united, the replaced bone disks solid, and the cranial opening entirely filled in with bone, except at its lower part, where the fragments had been dislodged by the withdrawal of the iodoform-gauze tampon. Five months after the removal of the tumor there was no positive evidence of recurrence of the growth. Slight attacks of epilepsy have occurred at different intervals. The increased aphasia and agraphia may possibly indicate the invasion of more cerebral tissue by sarcomatous cells; but this is not certain, as lately this has greatly diminished. In a postscriptum note, dated four weeks later, it is stated that the patient's condition has been greatly improved.

Von Bergmann²²⁶_{H.4} is not so enthusiastic as many of his colleagues in his expectations as to the success attainable in the future by the operative treatment of tumors of the brain. He teaches that an operation can only be thought of in cases where localization of the tumor is rendered possible by well-marked focal symptoms, and where these are absent exploratory trephining, even, is contra-indicated. Other contra-indications to an operation are presented when the swelling, giving rise to focal symptoms, is a syphilitic or tubercular product or a malignant growth. Another condition which renders an operation unwarrantable is an unusual size of the tumor. Diffuse infiltration around a cerebral tumor should be suspected where distinct and rapidly developing symptoms of compression are associated with ill-defined focal symptoms. In the technique of operations undertaken for the removal of a cerebral tumor the author insists on the importance of careful hæmostasis. Vessels should be tied whenever this procedure is possible. Troublesome parenchymatous oozing is best controlled by stuffing the wound with iodoform gauze, held in place by a carefully applied bandage. The cerebral œdema following the removal of extensive tumors is mainly due to the removal of large portions of the cranial vault, which, by diminishing extravascular pressure, determines congestion of the vessels of the brain and meninges and effusion into the perivascular spaces. In cases where a cerebral tumor is accompanied by grave cerebral symptoms, such as coma or unconsciousness, it is almost certain that a marked œdema is present, and the attempt to remove the tumor during the stage of coma he considers unjustifiable. One of the essential prerequisites of a successful operation he considers accurate

localization of the tumor before the skull is opened, the more so as its size and limitations can seldom be accurately defined before the operation. If the situation of the tumor is known, the surgeon is warranted in trephining and in making an exploratory incision into the white substance of the brain. If the endocranial exploration shows that it is impossible to remove the tumor, the operation should be suspended and the wound dressed, as after an ordinary trephining for depressed fracture of the skull, with laceration of the dura mater.

One of the first, if not the first, intentional attempts to remove a tumor of the brain is recorded by Macewen,⁶ of Glasgow. The case is remarkable from the fact that even at the time the tumor was accurately located before the operation. The operation was performed as early as 1879. The totality of the symptoms indicated a lesion of the left frontal lobe of the brain. It occurred in a patient, the subject of a small tumor above the left eyeball in the orbital cavity. A tumor had previously been removed from that position, and it had now recurred. Well-marked cerebral symptoms had since developed. Left pupil dilated and not sensitive to light. Headache and diminution of mental vigor. Later, convulsions occurred, the initial stage of which was carefully recorded by an intelligent nurse, without which the key to the brain lesion, as indicated by the convulsions, would have been lost, as when she came under Macewen's observation they had become general and threatened speedy death. The convulsions were, at the outset, strictly confined to the right side, commencing in the face and arm and confined to these parts during the initial attacks; the leg on the same side was affected during the third seizure, and ultimately the convulsions became general, with complete loss of consciousness. The symptoms were referred to extension of the irritation to the lower and middle portions of the ascending convolutions from an irritative lesion in the left frontal lobe. Trephining was done midway between the centre of the ascending convolutions and the anterior aspect of the cranium. At this point a minute nodule, the size of a barley-grain, was detected on the outside of the skull. A large disk of bone was removed, and a tumor of the dura mater, which was compressing the brain, was exposed. It was half an inch in thickness at this point, gradually becoming thinner and spreading all

over the anterior two-thirds of the frontal lobe (Fig. 25). The tumor was carefully dissected out along with the meninges, where they were involved in the growth. The patient recovered rapidly and was restored to perfect health. She lived for eight years afterward, and ultimately died of Bright's disease. The skull and brain were examined, and there was no trace of further tumor growth.

In another case, occurring in a boy of three years, a brachio-crural monoplegia with late rigidity was present, the result of a traumatism received eight months previously. After opening the skull, a large, thick-walled, subdural cyst containing clear fluid was found pressing upon the motor convolution (Fig. 26), and a spicula of bone detached from the inner table of the skull was seen to have penetrated the brain. These were re-



FIG. 25.



FIG. 26.

(*London Lancet.*)

moved and the bone replaced. The patient made an uninterrupted recovery. The paralysis, with the contraction of the muscles, passed off to a great extent. He could neither walk nor stand before the operation; now he can run about and use his hand well, though there is still a paresis in both. The same author removed successfully a tubercular tumor of the brain. It occurred in a girl, aged seven, the subject of frequently recurring attacks of severe epileptiform seizures, followed by paralysis of the affected parts. The first symptom was a severe pain in the great toe of the right foot; shortly afterward protospasm of the same toe lasting about five minutes. Sometimes this ended the attack. More frequently it was followed by clonic contractions of the muscles of the right foot, leg, and thigh. Occasionally the muscles of the front, the right side of the face, and right arm were affected and but very rarely muscles on the opposite side. Though there was

paralysis in affected parts, sensation was normal. From the great number of fits, the limited area involved, and the fact that sensation was not disturbed, a cortical lesion was diagnosticated. From the family history it was surmised that the lesion was tubercular. During the operation the upper portion of the ascending convolution was exposed, and, with the exception of a few tubercular nodules the size of barley-grains adhering to the vessels over the upper part of the ascending frontal lobe (Fig. 27), there was nothing visible on the surface. On careful palpation of the ascending convolutions there was found in the upper part of the ascending parietal a circumscribed nodule buried in the brain-substance, which on exposure by cutting through the gray matter was seen to be a tubercular swelling about the size of a hazel-nut, which was enucleated without any difficulty. As an immediate result there was prolonged trepidation of an erratic kind, affecting the muscles of the right side of the body, but especially those of the arm and leg. These lasted for two weeks and subsided gradually. There have been no fits for over a year, and the girl is now in excellent health.

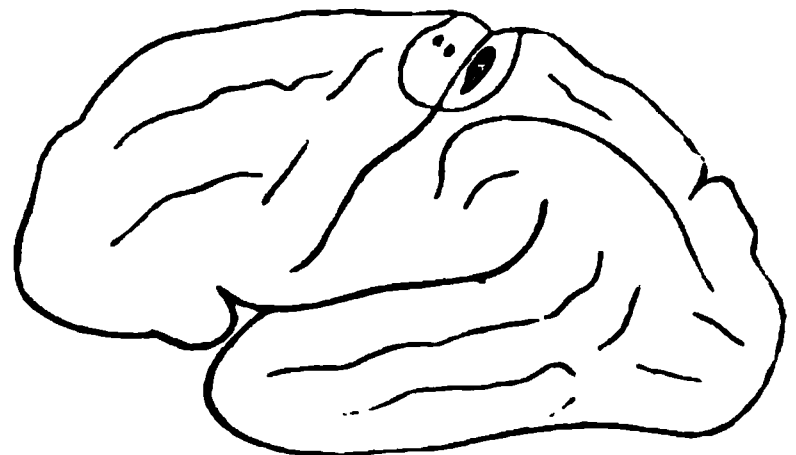


FIG. 27.
(*London Lancet.*)

Another operation for cerebral tumor, which upon exploration it was found impossible to remove, has been reported by Heath.⁶_{Apr. 7} The patient, aged twenty, was first under the care of Ross, September, 1886, when he stated that he was subject to fits and complained of headache and of weakness in his left arm and leg. He denied that he ever had syphilis. When six years old he had a fall on the flags which stunned him, and again, later, he had a fall on his right temple, and the next day found he had lost the sight of his right eye. The first attack of epilepsy occurred about Christmas, 1886, and he has since had frequent attacks. During the fits his left arm is drawn up, and his head to the left side. Pain in head is referred to the vertex. When examined by Ross, atrophy of the optic disk on the right side and commencing atrophy on the left were found. Paresis of left facial nerve, also partial paralysis of left arm and leg. Ross concluded that the lesion was located somewhere anterior to the ascending frontal

convolution and pressed back on the motor centres. A tender point was found an inch and a half behind the external angular process of the frontal bone and two inches up from the zygoma. Operation by Heath, October 13, 1886. A trephine was applied over the tender point and a disk of bone the size of a florin removed. The dura mater bulged into the opening, and on being incised exposed brain-matter which was of a darker color than normal. This was cut into, when it was found that the growth was farther forward, so that more bone was removed by means of *rongeur* forceps. More dark and congested brain was exposed, and on cutting into this a deeply seated, somewhat globulated tumor could be felt extending still farther forward than was expected. It was fixed to the base of the anterior fossa, and accordingly it was determined to abandon the operation, and the flap was stitched and a drainage tube inserted and the wound dressed antiseptically. On the third day a hernia cerebri formed. About a month after the operation the sight of his left eye was almost lost; the ophthalmoscope showed great anæmia of the optic disk. Thirteen months after the operation the seat of operation presented a soft, fluctuating swelling of considerable size, which caused pain on pressure. Pupils dilated and sight nearly destroyed. Patient complains of weakness in left leg, but can walk quite well; looks in good health, but of late headache has been distressing. Left arm still feeble. Epileptic attacks also returned with greater frequency.

Park¹_{Nov. 17} removed a cystic tumor of the brain which formed after a trauma and gave rise to epilepsy. The patient was a man aged forty-seven. Fourteen months before the operation he was thrown from a wagon; totally unconscious for sixteen hours; slight paresis of right leg; paralysis of right arm; nearly complete aphasia. First epileptic attack four months after injury. Of late frequent seizures. No scar or depression. Diagnosis: cystic degeneration of blood-clot involving centres for right arm and speech. Operation, November, 1886. After trephining dura bulged into the wound; fluid felt underneath; bone removed with surgical engine. A cystic tumor found containing an ounce and a half of clear fluid; size of cyst, five by two centimetres. The interior of cyst was scraped, its margins stitched to those of the dura, and drainage secured. Satisfactory healing of wound. The result was but partial improvement; no marked difference in speech.

SURGICAL TREATMENT OF ABSCESS OF THE BRAIN.

Methodical exploration of the brain in cases presenting symptoms indicative of suppuration and the radical treatment of abscess, if found by incision and drainage, have become established procedures.

During the last year Sir W. Stokes,² read a paper on a case of successful trephining for cerebral abscess. The man had been struck with a poker on the left side of the mesial line of the head and about an inch anterior to the coronal suture. He was treated as an out-patient at another hospital, and only came under the observation of the reporter several weeks after the date of injury. He soon presented brain symptoms, became convulsed and comatose, and it was determined to operate. A small fracture was found under the scar, the dura bulging into the wound; an exploring needle was introduced to the depth of an inch and a half, and pus was at last found. The dura mater was then incised, and one ounce and a half of pus was evacuated. The patient completely recovered, and is now attending to his ordinary work. The paper noted eleven other cases of abscess which had been operated upon by various surgeons and discussed the questions involved. A case of traumatic abscess of the brain located between the dura mater and surface of the brain was promptly relieved by an operation by Bayer,⁹ of Prague. The patient was a laborer, who sustained from machinery a multiple fracture with depression of the left parietal bone. On the supervention of the aphasia, facial paralysis, incontinence of urine, and other symptoms of compression of the brain, Bayer enlarged the original scalp-wound, removed bony fragments with hammer and chisel, and found pus oozing through the dura. A cavity as large as an orange was emptied, the wound irrigated with an antiseptic solution, and dressed. Recovery, with restoration of function, resulted, the aphasia disappearing last.

Beck¹⁵⁰ saw a traumatic abscess of the brain develop in the case of a young man suffering from a compound fracture of the skull, caused by a falling brick. When brought into the hospital it was found that the left parietal bone was the seat of a comminuted open fracture, and a number of loose fragments were extracted and the wound closed. The wound healed kindly, and in three weeks the patient left the hospital. A few days later he was

attacked with vertigo, was unconscious for a short time, paralysis of left arm, and loss of speech. When he was seen by the reporter, five days after he had left the hospital, a dry scab the size of a quarter of a dollar was found at the site of the scar. At this point a defect in the bone the size of a pea could be readily detected. Speech imperfect, right arm powerless, pulse rapid, temperature somewhat increased. On removal of the scab a small fistulous tract was found, along which a probe could be passed in the direction of the superior longitudinal sinus to a depth corresponding to the length of the index finger. During the operation it was found, after enlarging the opening in the skull, that the dura presented a small opening, which was enlarged, and about a tablespoonful of serous pus was removed. Subdural exploration revealed a cavity the size of a walnut, the walls of which, as far as accessible to sight, presented yellowish-red granulations. Disinfection with a solution of sublimate one to one thousand. By irrigation, about a teaspoonful of detritus was washed away from the interior of the cavity. Cavity dusted with iodoform, drained, and external wound sutured. Marked improvement the same evening, and in six days paralysis of arm had nearly disappeared. Ultimately complete recovery.

How exceedingly difficult it sometimes is to locate an abscess in the brain is well illustrated by a case operated upon by Clark, and recorded ⁹⁹by Trumbull. A sailor had received a scalp-wound he knew not how. The wound was properly dressed, but had to be re-opened on account of suppuration. Two months later he had an epileptiform seizure, followed by headache, increasing drowsiness, stupor, and the pulse fell to forty-six. The skull was trephined at the seat of injury and a fracture discovered. On removal of the button of bone the dura appeared healthy, but bulged into the opening and did not pulsate. Two punctures were made with an exploring needle, but no pus was found. Another disk was removed in the line of fracture, when the same conditions of the dura were noticed. The aspirating needle again furnished no positive information. As a last resort a grooved director was pushed into the brain, when pus escaped freely along its groove. Over an ounce of pus flowed out through the crucial incision which Clark made through the intervening brain-substance. The cavity was washed out with a

1 per cent. solution of carbolic acid and a drainage tube inserted. The pulse at once rose to seventy-eight. Recovery followed without interruption, and within a few weeks the patient was able to be up and around.

At the last meeting of the Italian Congress of Surgeons, Ruggi,⁹ related the case of a healthy laborer, aged twenty, who received a severe blow upon the left parietal region, followed by paralysis of the right arm, and later by convulsions. Trephining revealed a spicula of bone from the internal table of the skull perforating the dura mater; the brain was contused, and blood and pus evacuated. The case progressed to comparative recovery without fever.

At a meeting of the Medical Society of London, Damar Harrisson, of Liverpool,⁶ read a paper on a case of cerebral abscess treated by operation. It was of traumatic origin, the injury having been received eleven years before urgent, and ten years before even slight, symptoms appeared. The patient, aged fifteen, was admitted into the Liverpool Northern Hospital, December 22, 1887, with partial right hemiplegia and severe cephalic pain. Eight days before admission he received a blow upon the right side of the head; three days afterward he was suddenly attacked with convulsions on the right side of the body. When they ceased the patient found that he had lost the use of the right limbs, especially the arm. During the succeeding four days he had eight similar attacks, accompanied by giddiness and headache, but no loss of consciousness. On admission there was marked paralysis of the right side of the face and neck, the right arm and leg. On examination of the head a cicatrix was observed on the left side, and a further inquiry from the patient's friends elicited the fact that eleven years before he had received a severe blow on the left side of the head, causing a wound from which bone was removed. During the last twelve months twitchings in the right arm had been observed, which were confined to the flexors of the wrist, the biceps and the deltoid. From these facts Harrisson came to the conclusion that there was probably an abscess of the brain situated in the motor area of the cortex. The old cicatrix, in marking by Thane's method, was found to correspond in position to the upper part of the left ascending frontal convolution. With an inch trephine a disk of bone was removed at the site of the cicatrix, the centre of

the opening thus made, being three-fourths of an inch in front of the fissure of Rolando. The bone removed was adherent to the dura and of very unequal thickness, a ridge occupying its centre, which had pressed upon the brain. The remainder of the ridge was chiseled away. As the dura presented nothing abnormal and did not bulge into the wound, nothing further was done, but the wound was kept open so as to be able to explore it if necessary. The next day the symptoms were improved; but during the following three days aphasia and restlessness set in, temperature fell to 97.2° F. (36.2° C.), and the pulse to 45. The brain was now punctured to a vertical depth of one inch and a quarter, and the puncture prolonged into an incision, through which nearly half an ounce of fetid pus escaped forcibly, as if under considerable pressure. The abscess cavity was disinfected and drained with horse-hair. On the fifth day the paralytic symptoms were less, and on the ninth drowsiness disappeared. A hernia cerebri developed, and it was noticed that on relieving this protrusion from the pressure of the dressing the pulse arose from sixty to eighty-four, falling again to sixty after two hours of reapplied pressure. Drainage was dispensed with fifty days after operation. Recovery was perfect and permanent.

In his classical monograph¹¹⁶⁷ von Bergmann makes some pertinent remarks in reference to abscess of the brain, from which I quote a few of the most valuable and practical points. Operative treatment in cases of abscess of the brain is of the greatest importance, as without it the patients are almost certain to die from extension of the disease, as the natural termination of suppurative inflammation of the brain is rupture into the ventricle or diffuse meningitis, either of which is rapidly fatal. Encapsulation of a brain-abscess in the strict sense of the word never takes place, as the product of inflammation continues to encroach upon the surrounding healthy tissue. In making a diagnosis, it is important to study the lesion from the primary etiological stand-point, as a primary or idiopathic brain-abscess is unknown. It may be laid down as a rule that a brain-abscess either follows an injury associated with some wound of any of the coverings of the brain, or develops in the course of a suppurative inflammation of the skull, most frequently a purulent inflammation of the middle ear; metastatic or tubercular abscesses also occur in addition. He distin-

guishes an acute cortical abscess occurring immediately beneath the site of the wound, which closely resembles a diffuse traumatic suppurative meningitis, and a later form, occurring even months after the injury, located in the substance of the brain and not in direct connection with the seat of injury. An abscess can form in the brain without injury to the bone or brain itself; all that is necessary is a loss of continuity of tissue, through which infection takes place. The greater number of abscesses are situated below the surface of the brain with healthy brain-tissue intervening between it and the surface of the organ. Non-traumatic abscesses are usually caused by chronic purulent inflammation of the middle ear. Such abscesses occur most frequently in the temporal lobe, or in one of the hemispheres of the cerebellum, the former being the most frequent location, and almost always on the side on which the ear disease exists. The diagnosis in such cases is often difficult, as a suppurative meningitis, a sinus phlebitis, or thrombophlebitis may occur in the course of the same affection and give rise to symptoms resembling an acute abscess. Again, many abscesses of the brain pursue an exceedingly chronic course, making a correct diagnosis difficult. The symptoms are grouped under three heads: (1) those due directly to the suppuration; (2) increased intracranial pressure; (3) focal symptoms. The fever which attends the suppurative process is often remittent for some time, and at each reappearance is more intense; headache is usually proportionate to the intensity of the fever, and there is, in addition, pain on lightly percussing the skull. The focal symptoms depend on the site of the abscess and the direction in which the cortex is compressed, and are most important in determining the site to be selected for operative treatment. The site recommended for operation in brain-abscess following ear disease is 4.5 centimetres upward from the end of a line extending four centimetres behind the external auditory meatus, and drawn from this to the lower margin of the orbit. Here the middle temporal lobe is reached and the principal branches of the middle meningeal artery are avoided. Bergmann prefers the chisel and mallet to the trephine in opening the skull. He advises the making of a free opening and the establishment of free drainage, but warns against the irrigation of the abscess-cavity as practiced by Macewen and others. He asserts that the surgeon should operate only on his

own diagnosis and cites a case in illustration where he was asked to operate, but in which the etiology was absent, and in which he would not operate; at the post-mortem, a few days later, a diffuse growth was found, fully justifying the refusal.

Macewen⁶ gives an account of a very interesting case of cerebral abscess, which came under his observation too late for successful surgical treatment, it being evident that the abscess had burst into the lateral ventricles. Prior to this, aphasia could be discovered through the clouded state of the patient's intelligence; there was paralysis of the left third nerve, and of the brachial and facial muscles on the right side. From these the extent and localization of the disease were determined. Notwithstanding that the patient was *in extremis*, the operation was performed. The membranes were congested, and the abscess was reached on pene-

trating a quarter of an inch of the cerebral surface. After several ounces of pus had been evacuated, something like a tennis-ball was seen floating in a sea of pus which still remained in the interior of the brain. This proved to be an old encysted abscess, in the periphery of which an acute abscess had developed, which had de-

FIG. 28.
(*London Lancet*.)

stroyed the whole of the temporo-sphenoidal lobe (Fig. 28).

The patient, though greatly relieved, died from exhaustion. It was seen at the post-mortem that the whole temporo-sphenoidal lobe had disappeared, and the bases of the two ascending convolutions were the seat of acute encephalitis.

Barker² relates the case of a man, aged forty-three, suffering from purulent inflammation of the right middle ear, who presented a complexus of symptoms indicative of cerebral abscess, drowsiness, twitchings above wrist and fingers, facial paralysis, pain over right side of head, dilation of right pupil, increased patellar reflex and ankle clonus on both sides. A cerebral lesion was suspected in or about the junction of the middle and lower third of the right ascending frontal and parietal convolutions.

The trephine was applied, and after removal of the disk of bone it was seen that the dura mater and brain were healthy, but

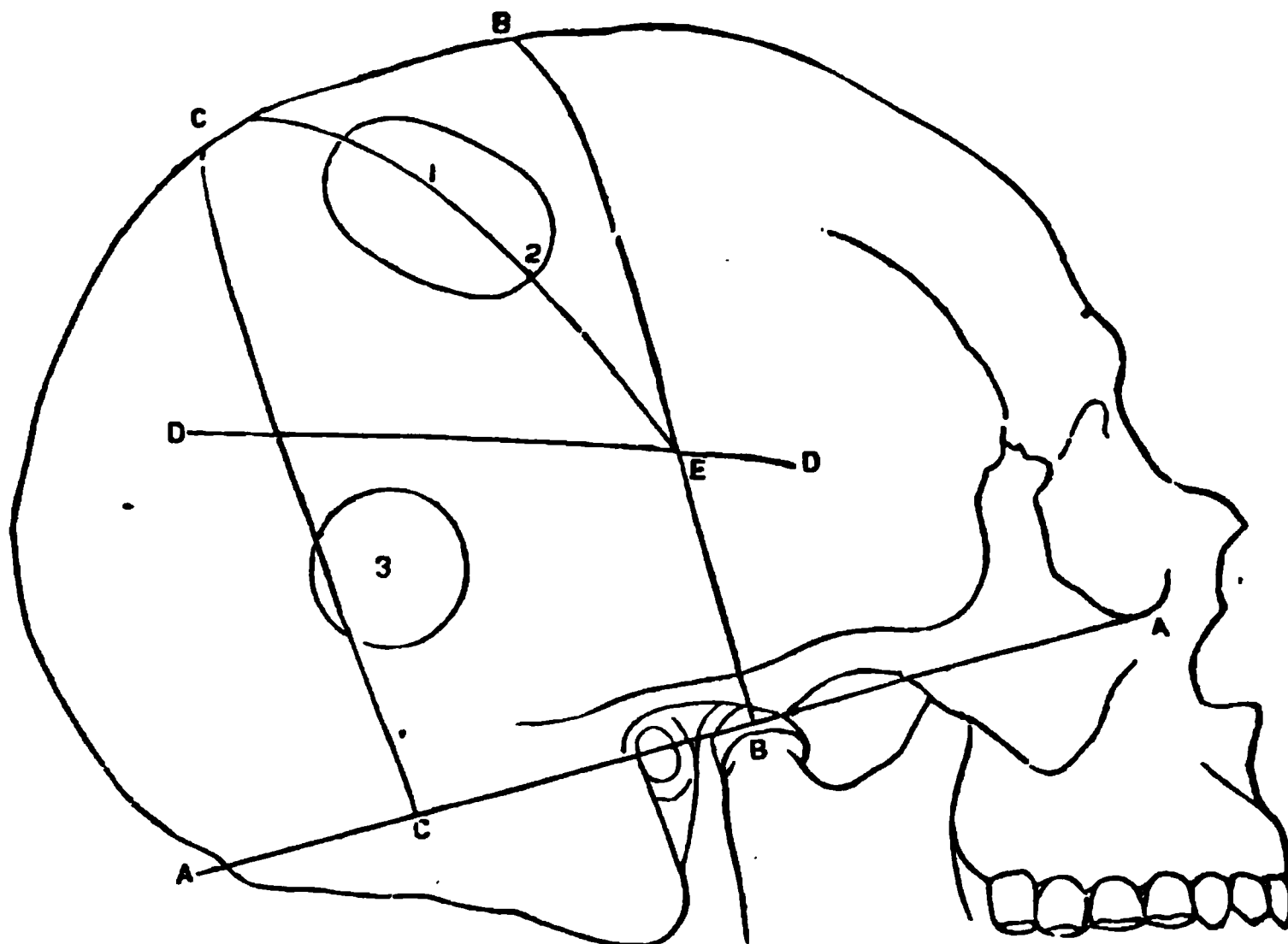


FIG. 29.—FROM A PHOTOGRAPH BY MR. MARRIOTT OF A SKULL, WITH THE MARKINGS ON IT GIVEN IN THE TEXT, AND THE TREPHINE OPENINGS MADE EXACTLY AS IN THE OPERATION. (EXACTLY ONE-HALF THE NATURAL SIZE.)

A A, Reid's "base line"; B B, vertical line from latter in front of the tragus, or from tubercle of superior maxilla; C C, second vertical line from posterior border of mastoid process to sagittal suture; D D, line marking Sylvian fissure; E E, line indicating Rolando's fissure; 1 and 2, first trephine opening over motor centres for head and face (the figures indicate the point of puncture in their order); 3, second trephine opening over first temporal convolution, one and a half inches above "base line," one and a quarter inches behind centre of long meatus of ear. The figure 3 indicates the point of the third puncture and drainage opening.

(British Medical Journal.)

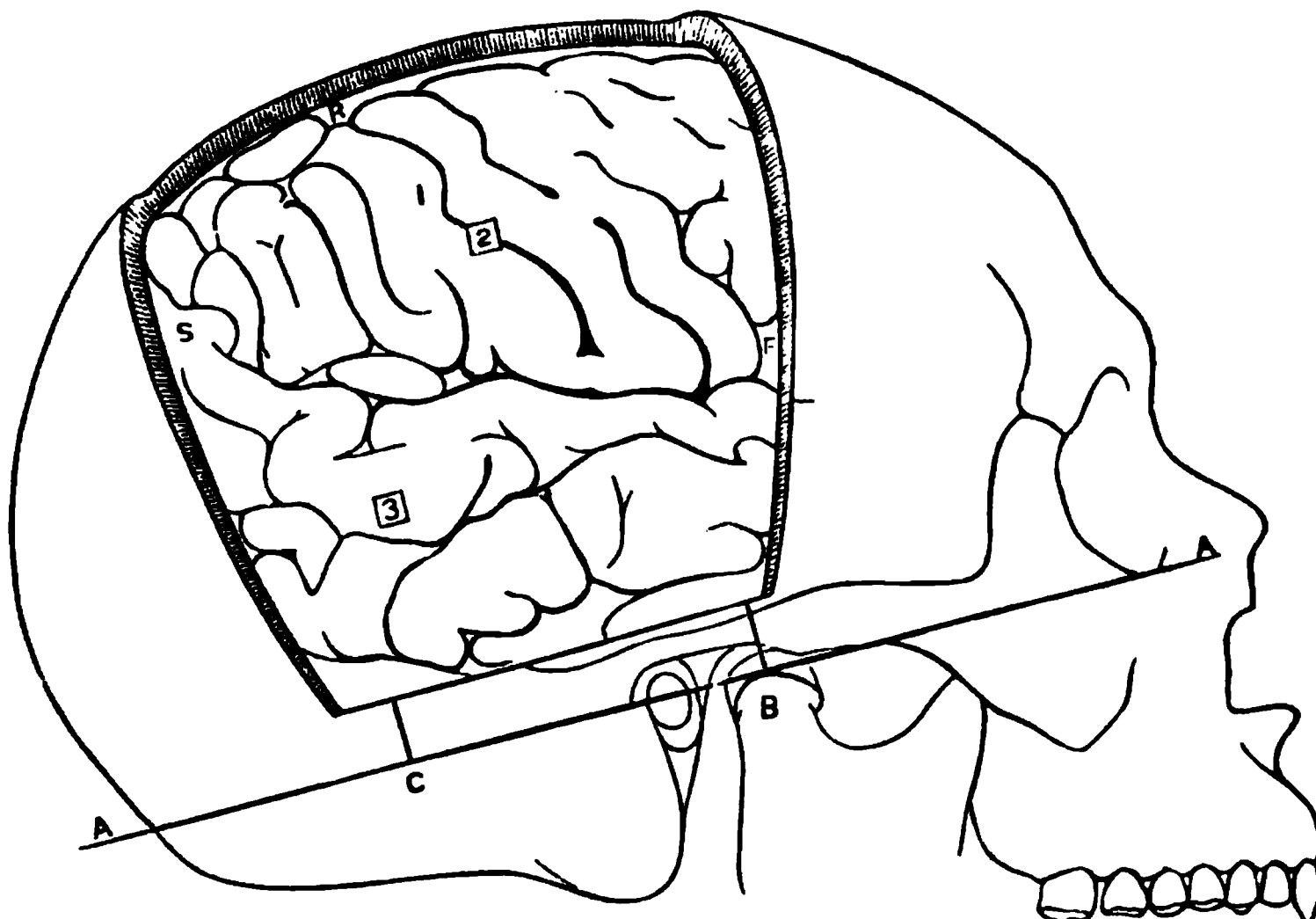


FIG. 30.—FROM A PHOTOGRAPH BY MR. MARRIOTT OF THE SAME SKULL WITH THE BRAIN EXPOSED, SHOWING THE POSITION OF THE PUNCTURES, WHICH HAD BEEN PREVIOUSLY MADE WITH SMALL WOODEN RODS WITHOUT OPENING UP THE DURA MATER. (ONE-HALF NATURAL SIZE.)

A A, base line; B B, fissure of Rolando; S, Sylvian fissure; 1 indicates the spot at which the first puncture was made for an inch, from which nothing came; 2, first wooden peg, lying exactly in the fissure of Rolando, passing downward and inward, and indicates where the second puncture reached turbid fluid; 3, second peg passes through the first temporal convolution inward and forward to meet the first, and indicates the spot at which the drain-tube was inserted.

(British Medical Journal.)

bulging into the opening. Deep fluctuation could be detected. An exploratory needle was inserted to a depth of an inch and a quarter in a direction downward and inward, and about two

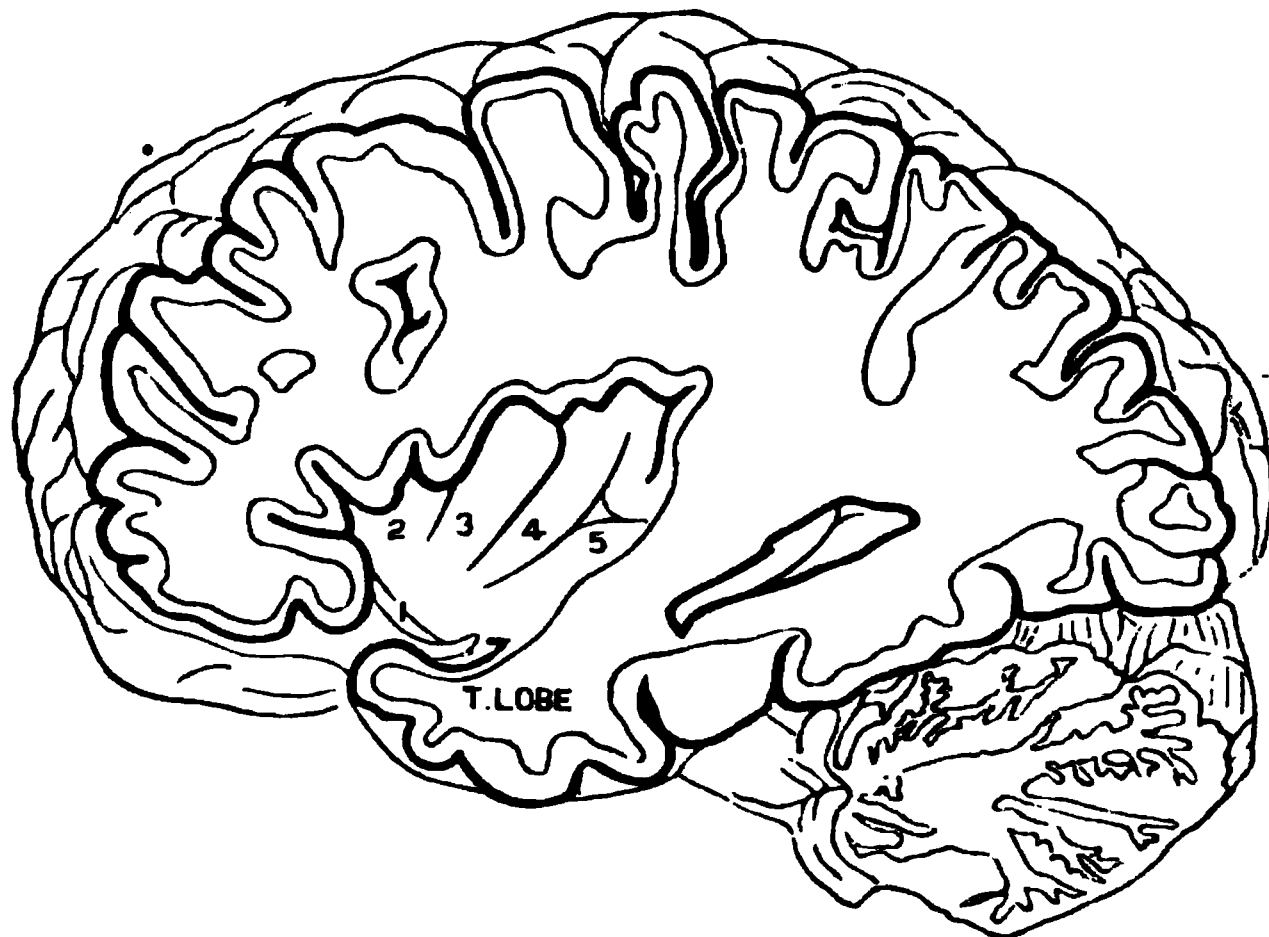


FIG. 31.—FROM ONE OF DALTON'S PHOTOGRAPHS OF AN EMBEDDED BRAIN, REDUCED TO EXACTLY HALF SIZE. THE SECTION IS VERTICAL AND LONGITUDINAL TO EXPOSE THE SPACE IN WHICH THE ISLAND OF REIL LIES.

1 2 3 4 5, the convolutions of the island of Reil; the position of the figures 4 and 5 would indicate as nearly as possible the spot reached by my two punctures in the operation; T LOBE, temporo-sphenoidal lobe; only the inner part remains.

(*British Medical Journal.*)

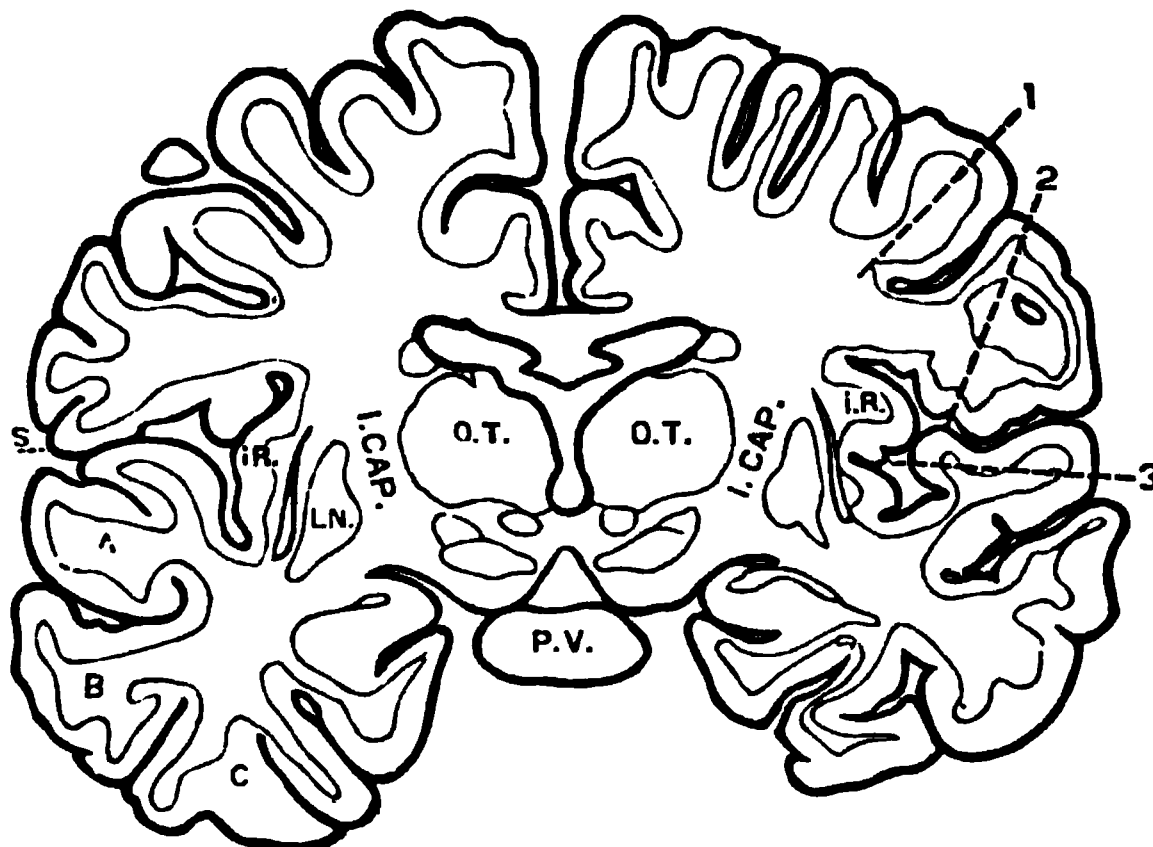


FIG. 32.—FROM ONE OF DALTON'S PHOTOGRAPHS, REDUCED EXACTLY TO HALF SIZE. THE SECTION IS VERTICAL AND TRANSVERSE IN THE REGION OF THE PUNCTURES MADE IN THE OPERATION. THE RIGHT HALF OF THE BRAIN IS APPARENTLY A LITTLE SHRUNKEN.

S, Sylvian fissure; A B C, first, second, and third temporal convolutions; P.V., pons Varolii; I.CAP., internal capsule, O.T., Optic tract; L.N., lenticular nucleus; I.R., island of Reil; 1, first puncture, directly vertical to surface of brain, which gave no result; 2, second puncture, downward and inward, which reached turbid fluid; 3, third puncture, inward and forward, through the first temporal convolution, into which a drain-tube was inserted; drained the same space as that reached by No. 2 puncture.

(*British Medical Journal.*)

drachms (eight grammes) of thick turbid serum were removed by aspiration. Another trephine opening was made one inch and a

quarter behind and above the meatus, when an abscess was reached, opened, and drained. The patient made a satisfactory recovery. Barker is of the opinion that nine-tenths of all abscesses of the cerebrum are situated within a circle three-fourths of an inch in diameter, the centre of which is one inch and a half behind and above the centre of the meatus.

For the purpose of showing the difficulties which are encountered in locating inflammatory and suppurative foci in the brain or its envelopes when such conditions develop at a distance from the source of infection, the following case is cited by Page.⁶ A sailor, thirty-eight years of age, who had fallen twenty feet, was soon after admitted into the hospital. He was unconscious. Hæmorrhage from left ear and nose and ptosis of right eye pointed to a fracture of the base of the skull. There was also a fracture of the left femur. When he became conscious he complained of pain in the head, particularly behind the left ear. Bleeding from the ear soon ceased, but was followed by a copious serous discharge. For six weeks the patient gradually improved, but after this time the discharge from the ear became purulent and soon after he became quite ill, complaining of chilliness and a general feeling of malaise. This was followed by a rigor, vomiting, and coma; pupils dilated and insensible to light; temperature, 140° F. (60° C.); pulse, 130. A semilunar incision was made in the temporal region and the trephine applied one inch and a half above and a quarter of an inch behind the left auditory meatus. On removing the button of bone the membranes bulged into the opening; they were incised, but no pus was found. An aspirating needle was then passed in several directions into the brain, with a negative result. The flap of the skin was replaced and the wound dressed. The patient died on the second day. At the post-mortem pus was found beneath the dura in the longitudinal fissure between the frontal lobes. The meninges of the brain at the base also showed evidences of suppurative leptomeningitis. Infection in this case undoubtedly took place through the lacerated tympanum.

A complicated case of cerebral abscess following suppurative inflammation of the middle ear came under the care of Bacon and Weir.¹ The patient was an adult who was the subject of a purulent discharge from the left ear of two years' standing. There

was evident extensive necrosis of the temporal bone, with a sinus in the anterior wall of the cartilaginous canal. Facial paralysis appeared on same side, and later an abscess, which formed above the external ear, was opened. The relief obtained was only temporary. A careful examination showed that the abscess-cavity communicated with the sinus through the wall of the auditory canal. Thorough drainage was made; an exploratory incision showed that the mastoid process was not affected. Some improvement followed and continued until he was attacked suddenly by headache with rise in temperature and aphasia, more swelling externally, and an increased discharge of pus. Cerebral abscess was suspected. The mastoid process was explored with a negative result. The anterior sinus was explored and found to lead to an opening in the sphenoid bone, where a pulsating mass was found. On puncturing this, pus escaped with broken-down brain tissue. Drainage. Some improvement was observed, soon followed by relapse. Trephining was now done over Broca's convolutions, and rubber tube passed from here to first opening. The patient died of secondary hæmorrhage, caused probably by injury of middle cerebral artery during the last operation.

Thomas Bryant⁶_{Sept. 1} gives the post-mortem appearances of an abscess of the brain which proved fatal by rupture into the lateral ventricle. A man, aged thirty, was admitted into Guy's Hospital with pleuropneumonia, in a condition which soon ended in death. Six weeks before his admission a beam had fallen upon his head, hurting him, but not producing any marked head symptoms or any bleeding from the ear or nose. Indeed, he had not given up work until two weeks before admission, when he felt ill, shivered, and had severe headache; he also soon lost his taste for sweet things. When admitted he had no paralysis, only headache and drowsiness. His temperature was normal. He had no convulsions. After death the brain was found, on removal of the skull-cap, to be flattened, so that it appeared to have no convolutions. Its surface was discolored in certain parts from what proved to be abscesses. A large and rather old abscess had burst into the posterior part of the right lateral ventricle, filling it with pus.

Miles¹²_{Sept.} trephined the skull in the treatment of a cerebral abscess which developed four months after a punctured fracture. The patient was a child, six years old, who had fallen upon a pair of

toy scales, striking its head and receiving what was thought at the time to be a simple scalp-wound. No symptoms until ten days after the accident, when the child became irritable and complained of headache. Two weeks later apparent recovery. After this time the child showed signs of drowsiness, followed by deviation of right eye and increased somnolence. A small, pulsating swelling the size of a pea was found on a line with the external auditory meatus. Pressure revealed a triangular defect in the bone. An exploring needle inserted to the depth of an inch showed pus. Opening in skull enlarged with trephine. Dura bulged into the opening; another exploratory puncture showed that abscess was located an inch beneath the dura. Free incision made, and an ounce of pus evacuated. Disinfection and drainage of abscess-cavity. The patient made a speedy and apparently complete recovery.

Fischer¹⁰²⁰ reports a case of trephining where the operation was undertaken for supposed cerebral abscess in the frontal lobe, secondary to purulent otitis media. After reaching the brain the pus was found by means of a hypodermic needle, and the abscess was evacuated and drained. The patient recovered so rapidly that she was able to leave her bed in nine days.

Goldstein⁵⁷_{Oct. 14} refers to a case that came under his own observation where a cerebral abscess developed without any trauma, and was not preceded by any suppurative lesion of the skull. As the focal symptoms pointed to the motor area as the probable seat of the abscess, the skull was opened in this locality and the abscess was found, opened, and drained. The symptoms due to cerebral compression ceased at once and two months after the operation the patient felt comparatively well. Soon after the operation a hernia cerebri occurred and the patient died four months later. The necropsy showed that the hernia cerebri and the fatal termination in this case were caused by a second abscess in the brain, complicated by encephalitis and meningitis.

Ferrier and Horsley²_{Mar. 10} report the following interesting case of abscess of the brain following purulent inflammation of the middle ear. A man, forty-seven years of age, was first seen by Mr. Coffin on November 25th of last year. He had been ill since November 10th. On the 15th a discharge, somewhat offensive, had come from the left ear, continuing for about ten days. When first seen

he was in a drowsy condition, but capable of being aroused. He complained of pain over the left side of the head, forehead, and back of the eyes, with photophobia. There was slight discharge from the left ear. Pupils and vision not disturbed. Pulse, fifty-two, intermittent; respirations, fourteen, labored, and sighing. Temperature normal. The drowsiness gradually increased and a few days before the patient was seen by Ferrier he had become aphasic and intellect was dull. There was no appreciable defect in the mobility or sensibility of his limbs, but the right angle of the mouth acted less energetically than the left. Optic neuritis was present. Grasping power of right hand, eighty pounds; left hand, one hundred pounds. At this time patient did not complain of headache, but a tender point was found two inches above and just anterior to a line drawn upward from the external auditory meatus. The diagnosis made was an abscess situated in the anterior third of the temporo-sphenoidal lobe, abutting or pressing on the fissure of Sylvius. The operation was performed by Mr. Horsley. When the dura mater was removed over the region indicated, the brain, which had a normal appearance on the surface, was seen to bulge forward into the opening in the skull,—a sure indication of pressure underneath; and on puncturing with a trocar a considerable quantity of inodorous pus—about five drachms—welled out through the cannula. The subsequent history was one of uninterrupted recovery. The optic neuritis gradually subsided. Already, on the fourth day after the operation, the optic disk cleared, the margins became more defined, and the extravasation of the edge of the right disk had disappeared.

Broca and Sébileau¹⁰⁰_{Aug. 16, 18} give us a good idea of the status of cerebral surgery in France. In reference to the location of cerebral lesions which are now submitted to surgical treatment, they are found either in the psychomotor or the latent zones. The great tolerance of the brain to operative interference they consider established, both by experimental research and clinical observation. They look upon strict antiseptic precautions as the most important prophylactic measure in the prevention of the principal source of danger in all operations on the cranium and its contents—inflammatory lesion of the brain and its meninges. The caution against attacking any of the essential parts of the brain, as the ganglia or ventricles, the tolerance of the brain to multiple exploratory

punctures, is alluded to by citation of Spitzka's case. As an anæsthetic they prefer chloroform, the anæsthesia to be preceded by morphia.

The operative treatment of abscess of the brain is indorsed by quotation of the old adage, *ubi pus ibi evacuo*. They refer to Dupuytren's case of abscess of the brain where this surgeon in the beginning of this century not only incised the dura mater, but also the brain, and was fortunate enough to reach the abscess. They credit Paul Broca with establishing the principles of cerebral localization as early as 1871, localizing a cerebral abscess, and when the trephine was applied over the region of the speech centre, finding pus between the bone and the dura mater. The patient died of meningo-encephalitis. With Bergmann, they assert that the acute traumatic cortical abscess is always diffuse, and hold out but little hope of successful surgical treatment, while the chronic abscess develops slowly, seldom if ever becomes arrested by encephalitis, but if left to itself destroys life by invading the lateral ventricle or by causing a diffuse meningitis. Multiple abscesses of the brain occurring as a manifestation of pyæmic infection contra-indicate an operation. Isolated aphasia occurring as a symptom of acute traumatic abscess of the brain is looked upon as a positive indication. They assert that abscesses developing in the course of a purulent inflammation of the middle ear are always located on the side of the affected ear, and with few exceptions in the temporal lobe. As a purulent inflammation of the mastoid cells may simulate abscess of the brain, the authors recommend that in doubtful cases the mastoid process should be first trephined, and if no pus is found the endocranial exploration should follow. If no improvement take place in a few days the same treatment should be repeated. The final result after operations for abscess of the brain is often unsatisfactory, as the abscess may have destroyed a considerable portion of the brain-substance, or may leave a large cicatrix, both of which conditions prevent a perfect restoration of the cerebral function. In support of this assertion the authors quote Gussenbauer's case, where, after a successful trephining for abscess of the brain, the patient later died with cerebral symptoms, and at the necropsy only a large cicatrix in the brain was found. A considerable part of the paper is devoted to a discussion of the propriety and the necessity of resorting more frequently to the trephine •

in the treatment of insanity. The subject of cerebral tumors is disposed of without, however, adding anything new to the literature of this part of cerebral surgery.

REMOVAL OF FOREIGN BODIES FROM THE BRAIN.

Since it has been shown that the presence of foreign bodies in the brain are a source of danger more from their acting as carriers of septic microbes than their presence, surgeons have endeavored to guard against one of the causes of traumatic septic meningoencephalitis by resorting to operative measures for their removal.

Nancrede,⁹ recommends search for and extraction of bullets in recent cases of gunshot-wounds of the cranium. He advocates Fluhrer's method of exploration with a probe made of aluminium, which is made to pass along the track of the bullet by its own weight. In case the bullet is not found, he advises free drainage. He refers to a case which came under his own observation where the bullet could not be found, and where he introduced a drainage tube about one inch into the brain-substance, evacuating considerable purulent fluid for one week, when the tube became displaced. Recovery ensued without a single bad symptom, although cerebral mischief had evidently commenced before the operation, some twenty-four hours after injury.

Nancrede⁹ treated another case of gunshot injury of the skull by free drainage after he had made a fruitless attempt to find and remove the ball, and the patient made a favorable recovery. The wound of entrance was located one inch and three-quarters behind the external angular process of the frontal bone and some distance above the zygoma, the direction of the bullet being downward, forward, and inward. No mental or cerebral symptoms. A depressed fracture was found, but no perforation. As it was certain that the bullet had penetrated, it was believed that the displaced fragments had resumed their normal position after the ball had entered. Trephine used, and a number of fragments of bone removed. Laceration of dura mater and middle meningeal artery was found. An aluminium probe was used in following the track of the bullet by gravitation. The probe reached the base of the skull, somewhere about the lesser wing of the sphenoid bone. Following the same track with a Nélaton probe, the bullet could not be detected. The operator was of the opinion that the ball

had deflected and was buried in the opposite frontal lobe. A tubular drain was introduced to the bottom of the wound. The external wound closed by primary union, the track in the brain suppurated slightly, but the patient recovered without any untoward symptoms.

Lanphear⁷² operated on a man aged twenty-eight, who was shot one inch to the right of the median line and one and one-fourth inches above the supraorbital notch. There was little hæmorrhage; a small quantity of brain-tissue escaped; a probe could be introduced three and three-quarter inches without difficulty. He was unconscious for twelve hours, with stertorous breathing and subnormal temperature. Later consciousness returned, but only for a very short time, when he again lapsed into a comatose condition. Twenty-six hours after the accident his temperature was 101.5° F. (38.8° C.), with evidences of meningeal hæmorrhage. He was trephined, though the ball could be located only approximately by the general course of the probe. Under the dura was a large clot of blood which was evacuated by incision, but the bullet could not be found; the wound was therefore considerably enlarged, and the ball discovered about three-fourths of an inch below the point of opening. It had struck the bone just a little below and external to the point of opening. The wound was washed with warm water of about 120° F. (49° C.) and covered with borated cotton and oiled silk; a drainage tube was left in the wound until the first dressing, thirty-six hours later, when, there being no discharge, it was removed. The temperature soon fell to normal and consciousness returned. The patient recovered without any untoward symptoms except slight impairment of memory and an occasional spasmodic movement of the left arm. Some time later it was reported that he was suffering from epileptic attacks. The same surgeon removed a bullet from one of the frontal sinuses and at the same time raised the depressed fragments of the internal table which had given rise to cerebral symptoms. The patient promptly recovered, although suppuration occurred, and he subsequently remained in perfect health.

In another case of pistol-shot wound, where the bullet entered one and one-half inches to the right of the sagittal suture and about two inches posterior to the coronal suture, the ball was found to have been split, one-half making its exit at the sagittal suture, where it

had cut the superior longitudinal sinus. The two openings were converted into one by chiseling away the bone. About two and a half ounces of broken-down brain-tissue were removed from a point corresponding to the centre for the leg. The patient soon regained consciousness, but only the left arm was paralyzed. Later the leg on the same side also became paralyzed. For a number of weeks the case progressed favorably, when cerebral symptoms again appeared, soon resulting in death. At the post-mortem a cerebral abscess was found in the left cerebrum a little above the corpus callosum. The cause of the abscess was a small fragment of the bullet which had passed through the right hemisphere and pierced the falx cerebri, becoming arrested at a point where the abscess was found.

Blake⁶²_{July} removed a railroad spike three and one-eighth inches long and three-eighths of an inch in diameter from the skull of a man who was found two days before in a helpless condition on a railroad track. The patient could not give any intelligent account of himself. The nail was only discovered on the second day, and had been driven in until the head of the spike pressed the scalp firmly. The point of entrance was a little to the left of the sagittal suture. It was extracted with a strong pair of forceps and a number of spicula of bone were removed at the same time. He died on the fifth day. The post-mortem showed that the spike had penetrated into the lateral ventricle.

That a foreign body can give rise to suppurative encephalitis after it has remained for a long time without any serious symptoms is well shown by the following remarkable case²²_{Jan. 18}: A man, thirty-two years of age, was admitted into the London Hospital complaining of a pain in his head and feeling drowsy. A few days after his admission symptoms of apoplexy appeared, and he died a few hours later. On making a post-mortem examination of the brain, an abscess, the size of a turkey's egg, was discovered at the base, evidently not of recent formation, inside of which was a pen-holder and nib, measuring altogether some three inches in length. This foreign body must have been in its position for some considerable time, it being embedded in bone. No trace of injury to the corresponding eye or nostril could be detected. The widow of the deceased had never heard him allude to any injury of the kind, and it is quite unknown how and when it was inflicted.

MENINGOCELE.

At the last meeting of the German Congress of Surgeons, Alberti⁴¹_{Apr. 10} showed an infant on whom he had performed an operation for meningocele. The swelling was located over the occipital region, and soon after the birth of the child measured thirty centimetres, and the hydrocephalic head measured thirty-eight centimetres in circumference. The skin over the central part of the tumor presented a cicatrix. Fluctuation, but no pulsation, could be felt. Pressure upon the swelling when the child cried arrested crying and brought on asphyctic symptoms, but as soon as the pressure was removed the child again began to cry. The operation was performed on the second day. After tapping, a circular incision through the skin was made near the base of the swelling and the skin reflexed, after which the neck of the sac was compressed with a clamp, the superfluous portion excised, and the wound sutured. The wound healed by primary union. The hydrocephalus increased, however, very rapidly.

Roberts⁸²_{Nov. 10} extirpated a meningocele located just below the external occipital protuberance in a child four weeks after birth. It was very sensitive, the slightest touch causing the child to cry violently. At the time of birth the growth was the size of a goose-egg, but in four weeks it had doubled in size. Under an anæsthetic an elliptical incision was made through the skin and fascia around the neck of the tumor, which was carefully dissected from the surrounding tissue, and then transfixed with stout silk ligatures, tying both ways close to the skull. The swelling was excised and found to contain two ounces of serous fluid. The opening in the skull was one inch in length vertically and half an inch horizontally. External wound drained and sutured. The patient made an uninterrupted recovery and remained well five months after the operation.

Celli⁵¹_{Sept.} operated on a congenital meningocele in a boy three years old. The tumor had existed from birth, was soft, tender on pressure, increased in volume with the acts of respiration and crying. It was in the occipital region, as large as a good-sized pear, the skin over it being neither red nor covered with hair, the pedicle fibrous, immovable, and located contiguously to the posterior occipital crest. About thirty grammes of clear, yellowish fluid were removed by aspiration, the pedicle remaining hard, painful, and

immovable. As the intracranial communication appeared to be slight, an attempt was made to enucleate it. The tissues were divided, layer by layer, until the dura mater was reached, when numerous adhesions were found, which were also divided. It was then found necessary to ligate the pedicle, which was done with a catgut ligature, after which the tumor was cut away. In the stump was a small canal within which could be seen nervous filaments. The opening of the stump was closed with fine catgut sutures; the first ligature then being removed, bleeding vessels were tied, and the wound was closed and dressed antiseptically. Subsequently there was some vomiting, with redness of the face, headache, and hyperæsthesia. An ice-bag was applied to the wound, and there was little rise of temperature. The wound healed by granulation in about fifteen days, and the patient was completely cured.

Another case of excision of a meningocele is reported by Tchüdnovsky.²⁵ The patient was a girl, three years of age, who was born with a swelling the size of a cherry in the median line of the frontal bone. This gradually increased in size, and when removed was as large as an orange. The pedicle measured nine centimetres in circumference. When the child was crying the swelling always increased in size; compression did not diminish its volume. In other respects the child was perfectly healthy. With a small trocar about three ounces of a limpid, slightly alkaline fluid were removed. This reduced the size of the tumor only slightly, and a few hours later it was as large and tense as before. On reflecting the skin and fascia a bilocular hernial sac containing cerebrospinal fluid was exposed. The outer covering was the dura mater. The sac was excised, the wound closed with sutures, and an antiseptic dressing applied. The operation was followed by severe convulsions, with coma ending in death twenty-four hours later. The necropsy showed that meningitis was the cause of death.

TRAUMATIC ENCEPHALOCLE.

Folet¹⁸¹ is of the opinion that when an encephalocele occurs after trephining it forms as much in consequence of the trauma as the operation. In support of this assertion he reports an interesting case which recently came under his own observation. A girl, ten years of age, in playing fell against a pointed iron rod, which penetrated the skull and dura mater at a point two centimetres to

the left of the sagittal suture. The child suffered but little from the injury, although the wound suppurated. On the eighth day quite a profuse hæmorrhage occurred, and on the thirteenth cerebral symptoms appeared, which were soon followed by hemiplegia on the right side. Two weeks after the injury the skull was trephined near the site of perforation, and with a chisel the two openings were converted into one. The dura mater was incised, but no pus was found, and two exploratory punctures yielded only negative results. Hemiplegia was not influenced by the operation, but consciousness returned. Two days after the operation hemiplegia was less marked, and three days later the child was able to leave its bed. However, the wound, instead of healing, became the seat of a hernia cerebri, which in a short time attained considerable dimensions. The protruding mass presented well-marked fluctuation. As the fungous mass continued to increase rapidly in size, about ten punctures with Paquelin's cautery were made. A small portion was also excised for microscopical examination. The operation made no impression in reducing the size of the hernia, and the healing process required about five months. During the process of cicatrization the swelling became gradually smaller, and when the whole surface was covered with skin the defect in the bone could be readily detected, and through it cerebral pulsation could be felt. Under the microscope the part excised showed granulation tissue and not a trace of white or gray brain-substance. He believes that many hernia cerebri are in reality not cases of protrusion of the brain, but granulation swellings caused by circumscribed inflammation of the meninges.

TREPHINING FOR EPILEPSY.

During the last year the literature on the operative treatment of epilepsy has been enriched by the report of a number of instructive cases.

Oliver,² reports the case of a lad sixteen years of age, in perfect health, who participated in a tug-of-war, when suddenly some of the boys let go and he fell violently upon the side of his head upon the ground. For a few moments he was stunned, but he soon regained consciousness and appeared to be as well as usual. Two weeks later he had his first seizure. When he recovered consciousness he complained of pain in the right side of

his head. From that day he had several fits daily. In the history of the case it is stated that only one member of the family, a sister, at the age of nine, suffered from fits, which were regarded as epileptic, and which suddenly disappeared after a severe fall when she was twelve years old. The boy complained of a severe pain localized over the right temporal bone, over an area an inch in diameter, located at a point almost midway between a line drawn from the outer angle of the right orbit to the ear, and about one inch and a half above it. This place was also exceedingly tender on pressure. Before and after each epileptic seizure the pain and tenderness at this point were exaggerated. It was also noticed that in many of the severer attacks the left arm and leg were much more convulsed than the right, and that they were the first to be affected. In addition, hemiparesis on the left side lasted for several days after the fit; but occasionally the left limbs were the subjects of choreic movements over which he had no control, and which at times affected the opposite limbs, but never in the same degree. Ophthalmoscopic examination negative. As the usual treatment proved of no avail, the skull was trephined at the site of the painful spot, which was located anterior and somewhat inferior to the motor areas of the arm and leg. The disk of bone removed showed that the bone was of a healthy structure and not adherent to the dura mater. Although the latter appeared to be perfectly healthy and of normal tension immediately after the removal of the disk of bone, it soon rose into the opening to a level with the outer surface of the bone. The dura was opened by a crucial incision and several teaspoonfuls of serum, containing a few flakes, escaped. The underlying structures appeared to be healthy. A small drain was inserted and the dura and external wound sutured. More than two ounces of serum escaped the first day. After this time it ceased and the wound healed under the second dressing. The patient had several attacks during the first few days after the operation, but later the intervals became longer, until no fit occurred during a period of six months. After this time the attacks returned, but changed in character; the muscular movements were slight, and were never attended by loss of consciousness. The fits, as the author says, were rather those of hysteria, and under proper treatment disappeared, and for several months have ceased to trouble him.

At the University Hospital, Agnew,⁶² presented a case in which he had trephined the skull for epileptic attacks of thirteen years' standing, with three to four seizures a week. Although the operation was done over a year ago, the man has had but two seizures since, one brought on by prolonged exposure to the sun, the other by great mental excitement.

Algeri's⁷⁵ patient was a criminal, twenty-three years old, who five years before he came under treatment for epilepsy received a severe injury over the left frontal region. The healing of the wound required seventy days, and several pieces of necrosed bone had to be removed. The patient complained ever afterward of dizziness and severe headache, while at the same time his psychical conditions were changed. Epileptic seizures developed; first the attacks were slight, but gradually increased in intensity. A depression seven centimetres in length existed, and the scar was very tender to the touch. Two disks of bone were removed, and through the opening thus created in the skull a fragment of bone which impinged upon the hyperæmic dura mater was removed. Five months after the operation the patient's mental state had greatly improved, and the headache, dizziness, and epilepsy had disappeared.

At the last meeting of the German Congress of Surgeons, Fischer⁶⁰ presented a case where he had trephined the skull for traumatic paralysis. The operation was followed by a slight improvement, but soon after epilepsy developed. Trephining was repeated at the former site of operation, and since then both the epilepsy and paralysis disappeared.

At a meeting of the Manchester Medical Society, Hutton and Wright² showed a boy, aged eleven, who suffered for nearly three years from epilepsy, which at first affected the limbs equally, but during the last few weeks had been mainly right-sided, and accompanied by marked aphasia, with rapidly developing loss of mental power. A trephine two inches and a half in diameter was used and the dura mater reflected. Exploration of the brain to the depth of an inch in various directions revealed nothing abnormal. The dural wound was sutured, and the bone replaced after being cut into small pieces. Recovery from the operation followed without a bad symptom, but the mental condition remained unchanged and the fits returned in a few days, though with less violence.

Féré³_{Feb. 29} has communicated the case of a man whose skull in the region of the vertex was injured by a fragment of an exploded shell. Six months after the injury he was attacked with epilepsy, the seizures recurring about once in five days. About the location of the psychomotor centres a scar was found which, when touched, sometimes provoked a typical seizure. Three disks of bone were removed at the site of the cicatrix, which showed that the internal table was somewhat depressed. During the three months following the operation the patient showed no signs of an attack.

Walker,¹⁹_{June} trephined a man for epilepsy who had sustained an injury of the head eight months before. He was struck on the left parietal eminence with the end of a wagon-tongue. He was unconscious for half an hour. Four months later epilepsy devel-

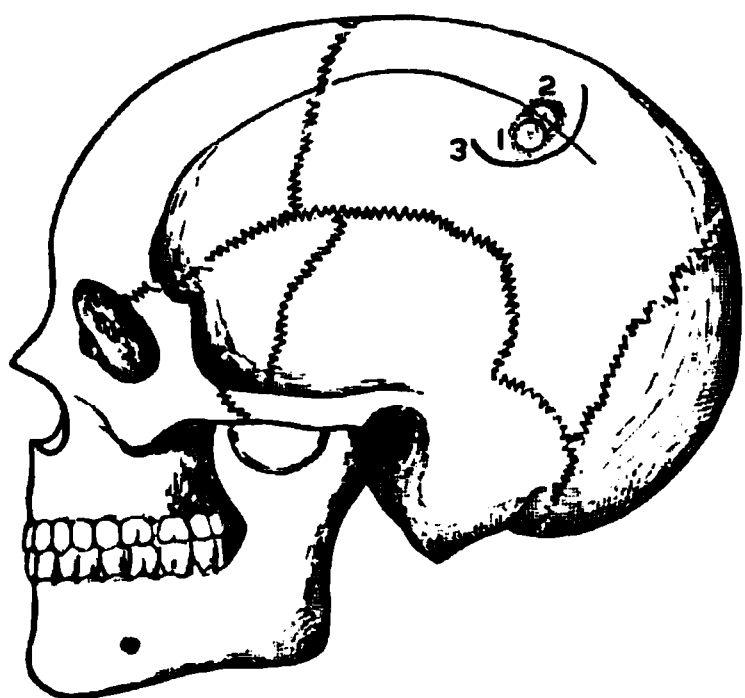


FIG. 33.

(*Medical and Surgical Reporter.*)

oped. He was and had been in good health otherwise, and stated that the disease was not hereditary in his family. At the seat of injury there was a circular depression three-quarters of an inch in depth. Circular incision was made as indicated by line (3, Fig. 33) and the periosteum was reflected. First button removed (1) was directly over the centre of the depression. As this did not cover the whole area of depression, another disk (2)

was removed. The wound was drained and sutured. A month later the patient was discharged with the wound healed. Up to this time no attack had occurred.

Case operated upon by Keen.⁵_{Oct.} Patient, a civil engineer, aged twenty-five, when seventeen years old, while walking fast to catch a train, felt dizzy and his head commenced to pain him. He was confined to his bed for a week. His headaches were of equal severity both before and after this, occurring from one or two attacks in a month to one in two months. In November, 1886, he fell one night a distance of nine feet. This inflicted a serious blow on the right side of the head, without, however, any lesion of the scalp. He was unconscious for a considerable length of time. Recovering from the immediate effects of the fall, he was ill for three

days. A week after the accident he noticed that the three left ulnar fingers had lost their feeling. If anything, the headaches after the accident were less severe. In March, 1887, while waiting for a street-car, he suddenly felt dizzy; starting to walk, he swayed to and fro, called a policeman, but before one reached him he fell down unconscious. He recovered in a few minutes, and found that his left hand and forearm were paralyzed. In a few minutes he recovered the use of them. In June following he had a dizzy spell of short duration. In September he had another dizzy spell, and after lying on the floor became unconscious. A bystander who witnessed the attack noticed a number of symptoms characteristic of epilepsy. In March the next year he had two similar attacks. In April Keen made the following diagnosis: Traumatic epilepsy from depressed fracture of the skull, with probably a fragment of bone broken from the internal table; possibly a cyst of the brain; certainly secondary traumatic changes. Centre of the left hand and supramarginal gyrus involved. As morphine had a bad effect on the patient, a drachm (3.88 grammes) of fluid extract of ergot was given before the operation. The head was shaved and thoroughly disinfected the day before operation. As soon as the flap was raised, a sharp furrow, about three-sixteenths of an inch in depth, was seen in the skull, showing, evidently, the old line of fracture through the entire thickness of the bone. An inch and a half trephine was now applied directly at the middle of the depression (Fig. 34).

As soon as the disk of bone was removed it was placed in a one to two thousand solution of sublimate, which was kept at a temperature of 105° F. (40.55° C.). The inner surface of the disk showed a ridge corresponding to the old fracture. Cerebral pulsation normal. The dura mater in a line corresponding to the fracture was dark and thickened, and looked as though a large vein or sinus was under it. A small opening was made in the dura by means of a probe; it was found to be adherent to the brain, underneath and beyond the limits of the opening. The opening in the bone was enlarged by a *rongeur* forceps, three-quarters of an inch backward, and half an inch anteriorly, until, finally, it measured three and one-quarter inches antero-posteriorly and one and one-half inches transversely, and exposed all the adherent portion of the dura. An incision was now made in the dura

mater, with the convexity backward, one-eighth of an inch from the margin of the opening in the skull, and the whole dura was detached from the brain, until the non-adherent portion was reached. This lifting tore the brain-substance, to which the dura was intimately attached. The brain underneath was discolored and indurated to a limited extent, and contained a serous cyst about a quarter of an inch in diameter. The application of an aseptic solution of cocaine appeared to act favorably in arresting the hæmorrhage from the brain. Three vessels were ligated with catgut. The altered brain-substance, including the cyst, was excised,

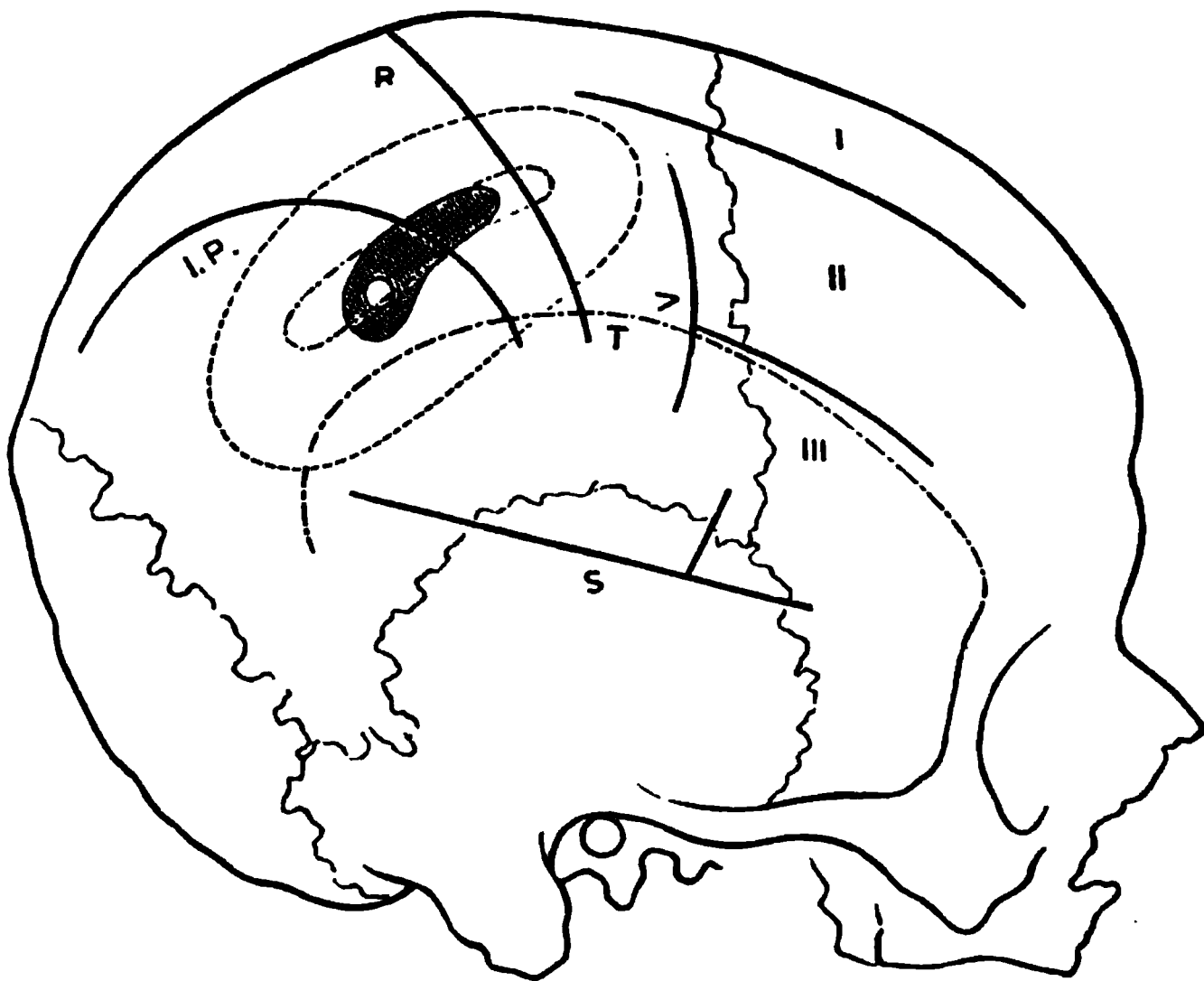


FIG. 84.—DIAGRAM OF SKULL. (DRAWN BY DR. JOHN M. TAYLOR.)

S, fissure of Sylvius; R, fissure of Rolando; IP, intraparietal sulcus; V, vertical or precentral sulcus; T, temporal ridge; I, II, III, the first, second, and third convolutions. The dotted line represents the opening in the skull; the interrupted oval line, the furrow in the skull. The shaded portion represents the part excised, the circle representing the cyst.

(*American Journal of the Medical Sciences.*)

amounting in all to about a teaspoonful. The adherent portion of the dura mater was excised, and on its under surface a small spicula of bone was discovered. One end was attached to the dura, while the other projected into the brain. The disk of bone was perforated at two points and was there placed on the under surface of the flap and secured in place by a chromicized catgut suture. Wound drained and sutured. The operation consumed an hour and a half, and as the patient showed sign of collapse at two different times, brandy was injected hypodermically. In the evening the wound was dressed, as oozing had taken place. Left hand

paralyzed. Any attempt at flexion resulted in extension of both fingers and wrist, and separation of fingers. At the end of second day redressed, drainage tube removed, and horse-hair substituted. Five days after the operation he was up and dressed and walked one-third of a mile. In his left hand he has gained sufficient power to make his grip painful to the one who examined him. Twelve days after the operation he returned home. A month later he returned for examination. At this time the site of operation showed a furrow. The reimplanted button of bone is firmly adherent to the scalp, but not on the sides of the opening. No headaches, and numbness of three ulnar fingers has entirely disappeared. No epileptic attacks at the time report was made, four months after operation. The only ocular lesion present was a species of monocular Argyle-Robertson pupil.

V. Bergmann¹¹⁶⁷ in his excellent monograph on the "Surgery of the Brain," speaks of the operative treatment of epilepsy, but warns against indiscriminate operating and lays down, as a rule, that an operation is only admissible when the surgeon has good ground for expecting a palpable and removable cortical lesion. Such a condition may be confidently looked for in those cases in which the spasms commence, as after cortical stimulation in animals, and gradually progress and become general, each successive attack occurring in the same order.

Macewen⁶_{Aug. 11} relates the case of a man, twenty-two years of age, who suffered from epileptiform convulsions, each lasting from two to three minutes, and as they occurred on an average every five minutes he consequently had over one hundred in twenty-four hours. The convulsions were limited to the tongue, the right facial muscles, and the platysma on the same side. When they subsided the parts remained paralyzed. Consciousness was not lost. Eight years previously he received an injury to the head, after which his right arm became weak. The lesion was referred to the ascending convolution, causing a Jacksonian epilepsy. The operation disclosed a cyst about the size of a filbert in the cortical and partly in the white substance of the brain, surrounded by a narrow zone of encephalitis (Fig. 35). In manipulating the medullary substance in removing the cyst, the patient, while under chloroform, had a convulsion, confined to the same group of

muscles as were affected in the attacks prior to the operation. The convulsion ceased with the removal of the cyst, and he has never since had another. The wound healed under one dressing, the paralysis of the facial muscles soon disappeared, and the patient has been able to follow his regular employment ever since.

Reclus²⁶_{Oct. 1} has practiced trephining for an injury to the head which was followed by epilepsy. The attacks were of daily occurrence and were provoked by the slightest excitement. By the operation he was able to remove an exostosis, but the longitudinal sinus was opened. It was sutured and plugged, and in eight days union was complete; bleeding was controlled by the finger of an assistant when the sinus was opened. The epilepsy has completely disappeared. Trélat has also trephined in a similar case with an equally good result.

Steinbach⁶²_{July 16} operated on a man, of about thirty-five, who had

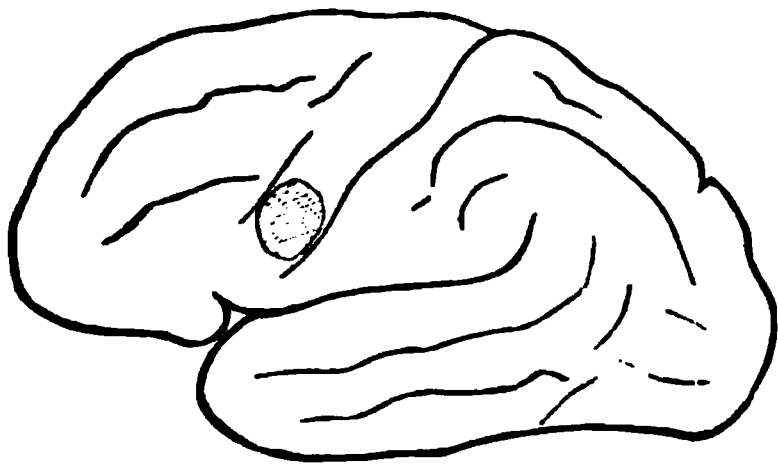


FIG. 85.
(*London Lancet*)

been violently struck on the head with an ax-handle when he was six years of age. Pressure made by a finger on the circular depression which was found in his skull was at once followed by a convulsion. A large flap of an ellipsoidal shape was turned up, and with a trephine a button of bone about one inch and a half in

diameter was removed. No spiculæ were found, but there was a small cicatrix in the dura mater. After making wound thoroughly aseptic the button of bone was replaced, drainage by strands of catgut and suturing of the wound completing the operation.

Rannie²_{May 19} reports a case operated upon by Williams where it was supposed that a removable syphilitic lesion had given rise to the epilepsy. The patient was a colored woman, thirty-five years old, a native of the colony. She was the subject of tertiary syphilis. She suffered for eighteen months from severe headache, which was referred to the right frontal and parietal regions. The same region was also tender to the touch, and the right ear was the seat of a thin, watery discharge, which occasionally became thick, yellowish, and offensive. She became gloomy, despondent, and peevish. During the last few months she had been attacked

repeatedly by epileptiform convulsions which lasted two or three minutes and were attended by loss of consciousness. The left limbs were first affected by the spasmodic movements. The clonic spasms affected mostly the left upper extremity and left facial muscles, the left leg being but slightly affected, and the right limbs and right facial muscles not at all. The diagnosis was a syphilitic growth in the membranes, involving the arm and face centres in the right cerebral hemisphere. The site selected for trephining corresponded to the right ascending frontal convolution. With an inch trephine an opening was made in the skull, which was found to be much thicker than normal and extremely dense. The dura beneath was thickened, and on cutting it a small quantity of puriform fluid escaped; this was found to come from a suppurating gumma in the dura. As the disease seemed to extend backward, a half-disk was removed on that side of the opening in the bone. As the lesion was quite limited, it was completely excised. Beyond slight local inflammation of the inner membranes, giving rise to opacity and thickening, the brain presented nothing abnormal at the site of operation. The dural wound was sutured with the exception of a small place for drainage. Throughout the operation the wound was irrigated with a warm sublimate solution (one to one thousand). She had a few slight seizures the first two days after the operation. Since that time no recurrence until the time the report was made, a year after the operation. The operation was also followed by great improvement in her mental condition.

Lucas-Championnière²¹²_{July} believes that trephining, when done under antiseptic precautions, is a comparatively safe operation. He has performed the operation five times for traumatism and fifteen times for medical affections. Four operations were done for epilepsy, with improvement in all of them. In epileptics he noticed that the cerebrospinal fluid was more abundant than in the other patient. Once a large arachnoidian vein was opened, and at another time the superior longitudinal sinus. Following Lister's suggestion in the treatment of such cases, the opening in the skull was plugged with three metres of catgut, which was left in place to be removed by absorption. He uses a trephine three centimetres in diameter and has found that without re-implantation of the button of bone, if no suppuration follows the operation, the

cicatrix is resistant, even so firm that after a certain time the pulsations of the brain can no longer be felt.

Franks,² reports the case of a young man who suffered from epileptiform seizures due to a fall of nine feet on the head. Trephining at the seat of injury over the left frontal lobe and opening a subdural hæmorrhagic cyst, which afterward was drained. The patient recovered from the operation without any untoward symptoms and no recurrence of attacks for three months; then the fits returned, but in a milder form.

Enrique de Arcilza,²⁶ of Barcelona, operated on a man for traumatic epilepsy who had been subject to attacks soon after the injury until the operation was performed, a period of ten years. The patient was thirty-nine years of age and was struck on the forehead by the stopper fired from a fowling piece, over the right eyebrow, producing a compound depressed fracture of the skull. Meningitis set in and the patient barely escaped with his life. Epilepsy soon commenced, the attacks at first occurring during the night and at long intervals. Lately they had been frequent. Chloroform produced such serious symptoms that its use was suspended and the operation was postponed until next day, when its administration was preceded by two-thirds of a grain of morphia (0.043 gramme). The effect of the anæsthetic, however, was the same. The morphine injection was repeated twice, and yet the narcosis was not complete, and the operation had to be performed under the most trying circumstances. The depressed fragments of bone were removed with the trephine and the patient recovered from the effects of the operation without any untoward symptoms. The frequency and intensity of the attacks were greatly diminished by the operation, and improvement was progressing at the time the report was made.

Hoffmann,⁶⁹ reports a case of epilepsy which he treated by trephining four years ago. Two years before the operation the patient, a man forty-six years of age, sustained a fracture of the skull, apparently compound, which healed with very little suppuration. After the wound had healed the patient gradually passed into a state of coma, which was attended by epileptiform convulsions. An adherent cicatrix was found on the right side of the head over the squamous portion of the temporal bone. Pressure upon the scar produced pain but no convulsions. When the soft

parts were reflected a gap was found in the bone at this point, in which the dura mater and the skin had become adherent. The margins of the bone around this defect showed a number of osteophytic protuberances on the outer and inner surface. In removing the margins of the opening, serious hæmorrhage was incurred from the middle meningeal artery, which could only be arrested by compression with a pledget of iodoform gauze held in place with a small hæmostatic forceps. The wound healed by granulation. For six weeks no attacks, which previously had occurred every two to three weeks. About the time the wound had healed a slight attack occurred. Since then the attacks appeared in a mild form every four to eight weeks.

Fleming²¹³ describes the case of a man, twenty-six years old, who, eighteen months previously, was treated in the hospital for a compound depressed fracture of the skull, produced by direct violence. He has since suffered from epilepsy and loss of memory. A cicatrix three inches in length was discovered over the site of the second and third frontal convolutions, and a distinct depression of the bone could be felt. The skull was trephined by making a crucial incision over the lower end of the depression, using a one and a quarter inch trephine. The thickness of the bone was very unequal, at one point a fragment having been considerably depressed. After removal of the disk, the depressed margins of the opening were removed with a chisel. The dura was not opened, but a piece which was caught between two fragments was ligated and excised. The patient recovered without a bad symptom. The epileptic attacks have gradually subsided since the operation and the last few weeks he was under observation they had disappeared entirely.

Keen⁵ reports a second case of epilepsy of uncertain origin, treated by excision of cerebral centre for left wrist and hand. The patient was a man, twenty years old, who, when he was thirteen years of age, fell from a chair while he was sleeping, and thinks he struck his head on the stove. Ever since this accident he has had epileptic attacks, always preceded by dizziness. During the attacks his head sometimes turned to one side, and sometimes to the other, before any other part of the body became affected; then the arms would begin to jerk and the convulsions would become general. On examination, April 23, 1888, a distinct furrow was seen on the right temple, which could be traced

over the temporal muscle into the temporal fossa. No such furrow existed on the left side. Examination of the eyes by Dr. Oliver, although showing distinct characteristic changes found in epilepsy, revealed nothing that would aid in localizing the central lesion. Operation performed April 30th; immediately another careful examination of the head had shown that in all probability the furrow previously described was a vein, an opinion which was verified after making the incision for the exploratory operation. The wound healed by primary union, and the patient remained under close observation for the purpose of ascertaining the order in which the muscular spasms appeared during the seizures. Each attack invariably began in the left arm and fingers. The thumb and fingers became rigid and extended, widely separated, the hand and arm in a right line and the elbow flexed; usually both legs were next attacked; the left usually preceded the right, and was crossed in front of it. Next the face became attacked, the mouth being drawn to the left. The result of these observations induced the operator to excise the centre for the left hand and wrist, as the probable seat of the lesion. The operation was performed in the same manner as in the first case. The bone and dura mater appeared normal; no bulging was observed, and the pulsation was regular. The dura was now partially incised and the brain exposed. The pia mater was very much infiltrated with serum, producing an œdematous layer, much obscuring the brain-tissue. After exposure of the brain the hand centre was found by applying the faradic current. On touching the anterior of the convolutions which were visible, the hand instantly moved, the wrist moving in extension in the mid-line and to the ulnar side at different touches, and the fingers being extended and separated. The opening in the skull was enlarged forward and downward till it measured two and a half inches antero-posteriorly by two and a quarter inches vertically (Fig. 36). The portion of the convolution (C) containing the hand centre, about an inch and a quarter long, as ascertained by the battery, was then incised vertically above and below with a knife, the lower incision being three-eighths of an inch above the temporal ridge. The lower end of the portion to be removed was then lifted and the loosened convolution was cut away from the underlying brain-substance with a pair of scissors. The battery was again used, and as the current applied to the brain outside of

the area of excision did not affect the arm it was considered that the whole hand centre was excised, the more so since applying the current to the white substance of the brain exposed by the excision resulted in movement of the arm. The larger vessels were tied and parenchymatous oozing was arrested by hot water and 4 per cent. cocaine solution. Subdural capillary drainage. The disk of bone and about fifteen fragments were replaced and external wound closed. Soon after the operation he had an epileptic attack ushered in by staring eyes, then the left leg was crossed over in front of the right, and the body became rigid. No movement of the left hand

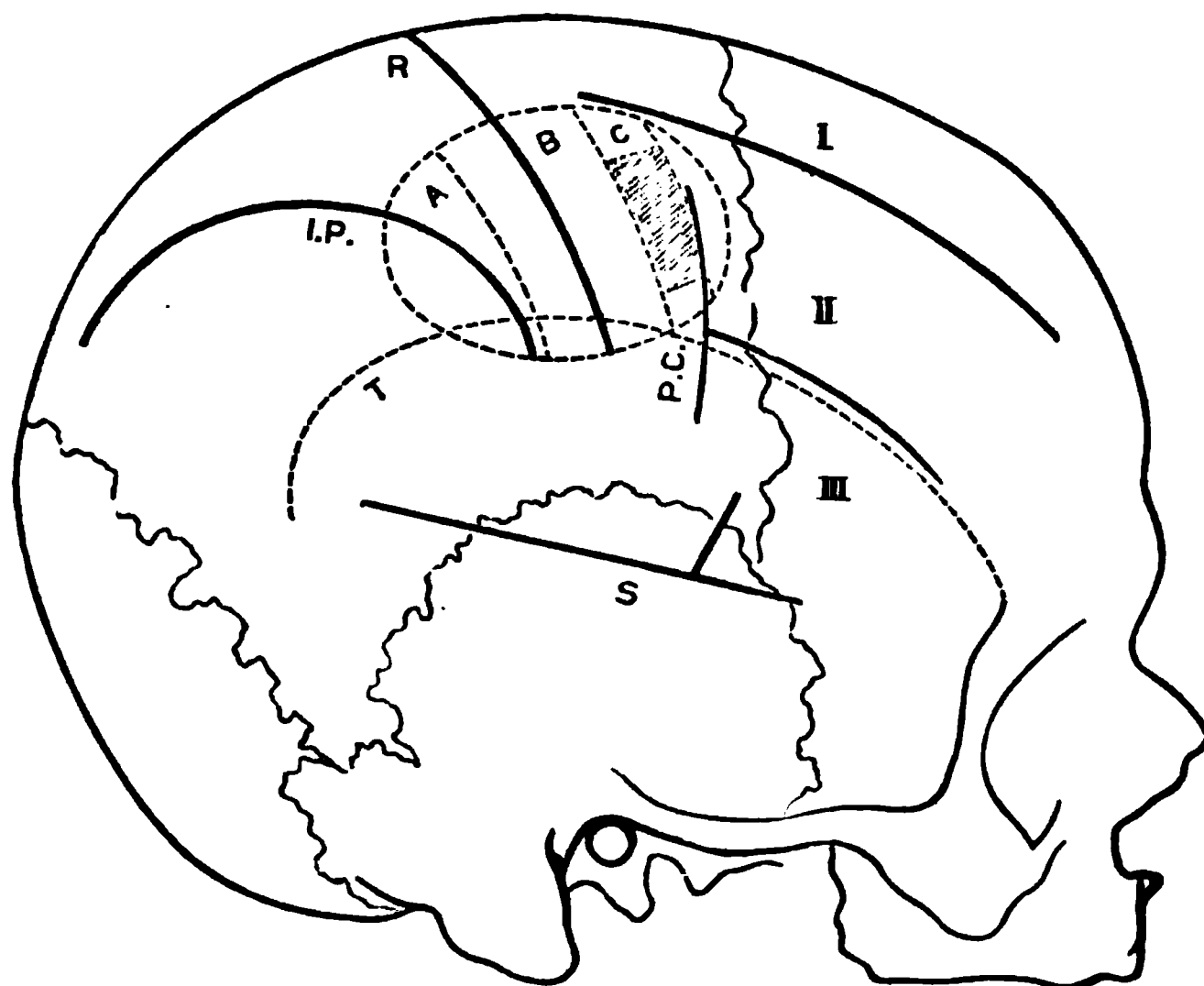


FIG. 38.—DIAGRAM OF SKULL. (DRAWN BY DR. J. M. TAYLOR.)

S, fissure of Sylvius; R, fissure of Rolando; IP, intraparietal sulcus; PC, precentral sulcus; T, temporal ridge; I, II, III, the first, second, and third frontal convolutions. The dotted line represents the opening in the skull; A, B, C, are the three convolutions first exposed in the trephine opening. The shaded lines represent the portion excised.

(*American Journal of the Medical Sciences.*)

or face occurred. Immediately after the operation the left hand was found to be paralyzed. The wound healed by primary union and the temperature never exceeded 100° F. (37.77° C.). The epileptic seizure occurred at longer intervals and became less severe. Four weeks after the operation he returned home. At this time the paralysis of the hand and wrist had not completely disappeared. Keen states that by "compensation it is nearly certain that in time he will regain control of the left hand through the other hand centre, a process already, in fact, beginning."

Another case of excision of the motor centres for epilepsy is

reported by Lloyd and Deaver.⁵ The patient was a man, aged thirty-five, who when fifteen years of age was struck on the head with a ball-bat, from which blow he became unconscious and was confined to bed for one week. He became epileptic six years after. Later the fits returned at varying intervals until the time of operation. Each attack was preceded by a well-marked aura commencing in the fore and middle fingers of the left hand, extending up the arm, through the neck, to the left side of the head, when the convulsions would begin. During one of these fits he was observed by a physician, who noticed that it commenced in the left arm. The fingers were flexed over the thumb, the hand flexed at the wrist, the forearm flexed upon the arm. The head was drawn over to the right side, the right arm and leg then became rigid, followed by general convulsive movements. Following the fit there was well-marked paresis of the left arm and left side of the face. The greatest number of seizures in a single day was twenty-eight. Operation performed by Deaver, June 12, 1888. Following Reid's and Horsley's lines, an inch and a half trephine was applied so as to include both sides of the fissure of Rolando in the region of the junction of the lower and middle thirds of the ascending convolution. This opening was enlarged by cross-cutting forceps. Nothing abnormal was discovered in the bones, membranes, or cortex by gross inspection. The faradic current was used in exploring the region with satisfactory results. Upon faradizing a point back of the fissure of Rolando, more properly the wrist centre, muscular contractions occurred as follows: Turning in of the thumb on the palm, flexion of the fingers, flexion of the wrist, extending to flexion of the elbow. At a point farther in front and below, and in front of the fissure seen in the middle of the wound, faradic stimulation caused marked contraction of the left facial muscles. In the absence of any visible organic lesions it was decided to excise these portions of the cortex. Accordingly a portion about twelve millimetres square was excised from the region back of the central fissure. No tumor could be found. The patient recovered from the immediate effects of the operation, and it was observed from the first that he slept with his left eye partly open. The left arm was parietic, the leg on same side not affected. Left face also parietic. During the night he had an epileptic attack and a few slight seizures for the first six days, but none since. On the fifth

day the flexors of the wrist and finger were almost completely paralyzed. Facial muscles contracted equally on both sides. From the sixth to the eighteenth delirium. During the third week he became rational and was able to leave his bed. Three months after the operation it was ascertained that muscular defects in the left arm still remained. Sensation to pain and heat perfect. With the dynamometer his right hand registered one hundred and thirty, his left hand, twenty. He had good control of the flexors of the wrist. The microscopical examination made of the portion of

FIG 37. MICROSCOPIC DRAWING FROM PORTION EXCISED POSTERIOR TO FISSURE OF ROLANDO, SHOWING GRANULATION AND SHRINKING OF LARGE MULTIPOLAR MOTOR CELLS. (WEIGERT STAIN) (DRAWN BY DR. ALLEN J. SMITH.)
(*American Journal of the Medical Sciences*)

cortex excised showed distinct degeneration of the large multipolar pyramidal cells with the same foci of hæmorrhage as in the smaller pieces (Fig. 37). A number of these large cells seemed to be in a condition approaching fatty degeneration, and small granular bodies, like fat-drops, make up the bulk, which is less than usual, and in most cases shrunken away from the walls of tissue about the cells.

Nancrede⁹ excised the thumb centre for Jacksonian epilepsy, and his patient made a favorable recovery, not only from the operation, but from the disease for which the operation was per-

formed. The patient was twenty-seven years old, and at the age of nine was struck upon the left parietal region with a piece of wood with such violence as to be rendered unconscious for three hours. Immediately after he had three convulsions. Epileptic attacks have occurred at varying intervals ever since, sometimes as many as forty in one day. In May of this year a button of dense bone an inch and a half in diameter was removed from the middle of the left anterior parietal region. A scar was also excised from the same location at this time, because pressure upon it excited the paroxysms. The bone was replaced and the wound healed kindly. Operation had a decided effect in diminishing the frequency of the attacks. In August the replaced bone, partially necrosed, was removed from a bed of granulations, a suppurating sinus leading down to the fragments. A few weeks after the operation the attacks again became more frequent, implicating regularly, at first, the right extremities and the right side of the face. Head always flexed laterally to the right.

Lewis' modification of Thane's and Horsley's method and Lucas-Championnière's method for locating the bregma were used to locate the fissure of Rolando. Morphia-ether narcosis. The trephine was applied below and in front of former site of operation. The dura mater having been incised, it was found that, except below and behind, the membranes were firmly attached over the whole of the lower two-thirds of the motor area. The opening in the skull was enlarged by uniting the two trephine openings until non-adherent portions of membrane were in sight. The thumb centre was located by the faradic current, and when found the thumb suddenly flexed and an epileptic seizure followed. The shoulder, elbow, forearm, and facial centres were readily determined in the same manner. One-half of the whole breadth of the ascending parietal convolution was excised, the apex of the wedge reaching into the corona radiata. Hæmorrhage was temporarily arrested by serre-fine and later by ligature. Drainage and suturing of soft parts. Considerable shock followed the operation and was treated by stimulants. Paralysis of thumb was complete after patient recovered consciousness; slight paresis of hand and nearly complete right-sided facial paralysis. On the fifth day, hand almost completely paralyzed, but this condition disappeared after thirty-six hours. Motion returned gradually in

all the paralyzed muscles, and the patient left the hospital twenty-eight days after the operation in good condition and not having had an epileptic attack since the operation. Roberts,⁹ in the discussion of Nancrede's paper, related a case of epilepsy which he operated on about six weeks before. The patient was a child, two and a half years old, with the history of having been struck on the head early in infancy with a heavy clock. No scar or depression could be found. The spasms, which occurred frequently during the day, were located in the left shoulder, left arm, and head. He applied the trephine about one and a half inches in front of the Rolandic line and a little to the right of the median line. First a two-inch trephine was used, followed by one half an inch less in diameter. Dura adherent. On opening the dura the pia was found œdematous, and between it and the dura there was a thin membrane, supposed to be a false membrane, possibly an inflammatory or hæmorrhagic product. The faradic current produced no response. The œdema was relieved by a small incision, and as the brain surface presented a perfectly normal appearance, nothing further was done. Catgut drain was inserted and the wound sutured. A discharge of cerebrospinal fluid continued for two weeks. Three seizures since the operation; they occurred within the first forty-eight hours after the operation and were slight.

William Carter, of Liverpool, collaborator, relates in a personal communication the following case of trephining for traumatic epilepsy: J. T., male, aged twenty-three, striker in a forge. Two years ago fell and cut his head over left Rolandic area. Unconscious for an hour. On the ninth day afterward he had an epileptic fit, the first in his life, then a rapid succession of fits. Unconscious for three days. Totally aphasic for the next week; partially so for other three weeks. Mouth drawn to left. Convulsions all on right side. For six weeks right hemiplegia and hemianæsthesia passing away, first from feet and then from arm. Patient remained well for two years. On October 21, 1888, two fits. On November 1st, at 1 A.M., a severe fit followed by the *status epilepticus*. The fits succeeded each other with rapidity, always affected the right side only, and were as follow: restlessness of right arm and leg; next, tremors of these limbs; lastly, tetanic rigidity of them, together with jerking of head to the right. Drawing of mouth to right and rapid blinking of right eyelid, and

slow nystagmus. Coma throughout. This condition had continued for seventeen hours when he was seen and trephined by Robert Jones. The pulse was then scarcely countable, the skin cyanotic, the breath rapid, shallow, and accompanied by râles, the pupils dilated, and the extremities cold. The spot for trephining was carefully selected so that its centre should correspond with the junction of the middle and lower thirds of the fissure of Rolando, and the circle contained within the trephine was found to have attached to it a piece of bone nearly an inch in length and half an inch wide, which vertically pierced the pre- and post-central gyri at the level indicated. The cut shown herewith is a reproduction of a photograph kindly forwarded to us by Dr. Carter.

There were two slight fits during the operation. The subsequent progress was satisfactory, and when seen on November 17 by the reporter the patient seemed quite well in every respect, except that the wound had not quite healed.

SURGERY OF THE NERVES.

Union after Nerve Suture.—Until a few years ago it was generally considered impossible for a sutured nerve to resume its physiological function within a few days. According to Waller and Ranvier, it was believed that the peripheral portion of a divided nerve necessarily must undergo de-

FIG. 38.—PIECE OF BONE
REMOVED FROM CASE OF
EPILEPSY

generation, even if nerve suture is immediately resorted to, before the reparative process is initiated. But the cases reported by Nélaton and Laugier would seem to encourage the belief that a more direct union and restoration of function is possible. Indeed, the experiments made on animals by Langerfeld, Gluck, and Wollberg seem to prove that a primary union of a divided nerve can take place.

Cavazzani³¹⁹ has made nine experiments on dogs, seven on the sciatic and two on the median nerve. The nerve was divided transversely and immediately sutured with catgut. The direct suture was employed. In two of the experiments function was restored to perfection within three weeks. Histological examination at the seat of section showed that the nerve-fibres were con-

tinuous from the peripheral to the proximal end. The axis cylinder in the peripheral portion of the nerve fibres was present, only that it showed here and there traces of fatty degeneration. As the result of his own experimental work, he comes to the following conclusions: 1. The peripheral nerve-fibres are capable of undergoing primary union in the same manner as other tissues. 2. Primary union of nerves is characterized by rapid improvement of the primary paralysis and a corresponding restoration of sensation and trophic innervation. 3. Nerve function is restored by rapid proliferation of the delicate axis cylinder and neurolemma of the proximal nerve-fibres, which retard the degenerative processes in the peripheral portion of the divided nerve.

Jencken¹ reports a case of unusually rapid restoration of function after suture of the ulnar nerve seven months after its division. Trophic changes had taken place in the parts supplied by the nerve, and anæsthesia was complete when the patient came under observation. The divided ends were found an inch apart, and could be secured in opposition only by forcibly flexing the wrist. Sensation had in great part returned four days afterward, and was perfect in a fortnight. The skin and muscles immediately began to recuperate, and the case resulted in a perfect cure.

Nerve Transplantation.—Gersung²² performed nerve transplantation on the person of Professor Fleischl, who accidentally wounded himself sixteen years ago while performing a post-mortem. The result was severe inflammation of the whole right upper limb, which was followed by the formation of neuromata on various branches of the median nerve, to relieve the pain of which resection of the nerve at various sites was resorted to, causing anæsthesia of the parts supplied by it. New neuromata, however, occurred, and finally the pain became so severe that a further operation became necessary. The neuroma, which was situated behind the volar-carpal ligament, was excised. A piece of the sciatic nerve of a freshly killed rabbit was then sutured to the ends of the cut nerve and to the connective tissue between. Primary healing of wound, and two months after the operation the pain had not returned, and sensation in the anæsthetic area was being gradually restored.

Nerve Suture à Distance.—Gluck⁴¹ relates the case of a patient who sustained a punctured wound of the arm with a pen-

knife four weeks before he came under his care, and who was then suffering from complete paralysis of the musculospiral nerve. He cut down upon the nerve at the site of injury and found it completely divided and its ends retracted so that the interspace between them measured five centimetres. The nerve-ends were vivified and so sutured at a distance with catgut that the catgut threads should furnish the route for the products of tissue proliferation from both ends. Soon after the operation the galvanic and faradic currents were used, and four months later motion in the muscles supplied by the nerve was restored. The object of the operation was realized and the satisfactory result obtained will induce surgeons to resort to the same measure in similar cases.

Nerve Suture—(a) Primary.—Richardson⁹⁹ reports two cases of primary nerve suture. The first patient was a man, aged thirty-two, who for six or seven years had suffered from a painful tumor near the elbow. A tumor the size of a cherry was detected above the internal condyle of the right humerus. The pain extended down into the hand. At the operation it was found that the tumor was encapsulated in the ulnar nerve, and, as enucleation could not be done, it was excised with the nerve. The nerve was stretched, and after the arm was extended so as to relax the nerve the ends were united by stitching the nerve-sheath with catgut. Primary union of wound. A few weeks later examination of the arm showed atrophy of muscles supplied by the nerve. The pain was completely relieved. Microscopical examination of the tumor proved that it was a sarcoma. The second case was a man, aged twenty-two, who had sustained a lacerated wound over the inner and posterior surface of the wrist just above the styloid process of the ulna. Ulnar nerve and tendon of flexor carpi ulnaris divided; nerve sutured with fine catgut. Tendon sutured in the same manner. Suppuration of wound. Patient discharged with a granulating wound, and as he subsequently returned to his work it is to be taken for granted that the result was satisfactory.

Frothingham²³¹ relates two cases of nerve injury that recovered with operation. The first case was that of a young man who had received a razor-cut across the anterior surface of the arm, about four inches above the elbow-joint. Brachial artery and median nerve were divided; artery ligated at both ends and muscles sutured. Twenty-four hours later wound reopened and nerve-

ends united by sutures, including only the nerve-sheath. Sensation returned rapidly to the area supplied by the median nerve, being apparently normal at the end of five days. Primary union of wound, sensation perfect at the end of twelve days. The second patient was a man, aged thirty, who received a razor-cut dividing both arteries of the forearm and median and ulnar nerves, as well as a number of the flexor muscles. The wound had been filled with Monsel's solution and superficial sutures applied. Reopening and disinfection of wound. The arteries were tied and nerves and tendons united with catgut. At the end of two days slight sensation in the palmar surface of all the fingers and thumb. Healing of wound in eight days. Sensation in the hand normal and motion returning.

At a meeting of the Surgical Society, at Berlin, Stenzel⁶⁰_{Aug. 2} reported two cases of primary suture of the ulnar nerve. The first case was a man, aged fifty-five, who attempted suicide by making a deep incision with a razor just above the left wrist. The ulnar nerve was completely divided, and was at once sutured with fine catgut. Nine weeks later motion had returned in the muscles supplied by the sutured nerve. The second patient was a young man who cut himself with a piece of glass just above the right wrist and severed the ulnar nerve completely. The nerve was sutured within half an hour. Two weeks later beginning restoration of nerve function. Twenty-seven days after the accident examination showed considerable atrophy of muscles, but nerve function improving.

Nancrede⁶¹_{Apr. 7} resorted to primary nerve suture in a case where both the ulnar and median nerves had been divided. The nerve-ends were found directed at right angles to their intermuscular spaces, and without suturing would have been infallibly fixed between the ends of the torn muscles in a dense mass of cicatricial tissue, resulting in a useless limb. He directs that fine catgut or silk should be used. The needle should be passed from below upward through the proximal end of the nerve at one border, across, and then passed from above downward near the opposite border, entering the needle from one-eighth to one-quarter of an inch from the cut end, according to the size of the nerve. The needle must now be passed from below upward through the distal end of the nerve at the border corresponding to the last passage of the needle

through the proximal end, across, and made to pierce the nerve from above downward, when the suture will be found to correspond to the free end of the thread in the proximal piece of nerve. Gentle traction with an appropriate position of the member will, by the tying of one knot, accurately approximate the nerve-ends; in a word, by this simple method all the advantages of the two separate sutures commonly recommended are obtained with a far greater degree of security. In his own case, in the seventh month after suture, *i.e.*, the usual time required for the degeneration and regeneration of a nerve, first sensation and then motion returned, until the time the report was made the boy could earn his living, and could use his hand quite well, although function was not completely restored.

Monod and Denucé¹⁸⁸_{Nov. 18} report a case of primary suture of the ulnar nerve in connection with a case of resection of the elbow-joint for tuberculosis in a man aged twenty-six. During the extirpation of the fungous capsule the nerve was cut. The nerve-ends were at once united with three catgut sutures. In eight days sensibility was completely restored. As the resection proved a failure, amputation of the arm was performed two months later, and the nerve was carefully examined at the site of suturing. Union was complete and the nerve was surrounded by firm cicatricial tissue.

Chuckerbutty²⁰⁶_{June} brought before the Calcutta Medical Society a case of primary nerve suture where nerve function had become completely restored. The patient was five years of age, and the injury was caused by the bite of a black monkey. The biceps muscles, median nerve, and some of the smaller arteries of the arm were divided. The boy could not move the thumb, index, and middle fingers of that hand. The nerve was united by direct suturing with catgut. The muscle was also sutured and the wound united. Slight suppuration in wound. Early restoration of nerve function, so that sensation and good motion returned in less than four weeks after the operation.

Syme²⁸⁷_{May 16} saw a patient six days after he had received a stab with a knife on the other side of the left forearm. The wound was about one and a half inches below and to the outer side of the outer condyle, and passed obliquely upward and inward. There was complete paralysis of the extensors of the thumb and fingers,

and supination was impaired. The wound itself was inflamed, and the radial and posterior interosseous nerves were found divided just beyond the division of the musculospiral. The ends of the peripheral portion were somewhat frayed, hence they were resected before suturing, which was done with catgut. The wound was thoroughly disinfected and dressed antiseptically. Primary union of wound. From the third to the tenth days after the operation sensation appeared to have returned, but a few days later it was diminishing. After this time the patient had not been heard from.

Albrecht⁹⁶ relates a case of primary suture of the radial nerve from the Zurich clinic. In this instance it is not possible to give exact data as to the recovery of function. On the twelfth day there could be performed an elevation of the carpus; on the fourteenth day an extension of the phalanges. The tactile sensibility was the same as at the time of the operation. He lays stress on mistaking the action of the interossei for that of other muscles, and the sensibility of the finger-tips as a sign of return of function of the radial nerve. Observation proves that the first signs of electric irritability appear in the course of the third or fourth week. In the majority of cases the return of function of the sutured nerve is placed in the tenth or twelfth week. In all cases authors agree that the process of recovery, once initiated, continued over a long period. Whether primary or secondary, it required months or years for complete restitution of function; while in some cases of primary suture the symptoms of recovery are early in onset, in others they are delayed as long as in secondary cases. It has been found that in all cases of successful primary nerve suture apparent atrophy of muscles and their loss of reaction to the electric current sets in. These persist for a time, but eventually recover. The electric reaction sets in through indirect channels. It is only after the lapse of time that the newly formed nerve-fibre reaches the muscle-electric irritability. The experimental or clinical primary union of a nerve with restitution of function in a short time has not yet been attained. This failure of immediate restitution is due to rapid degeneration of the fibres of the peripheral end of the nerve. A restitution with capacity of transmission and function occurs through the process of degeneration, which requires at least two or three months. The complete

restitution of function may last for years, the exact immediate coaptation by suture and slight muscular atrophy being favorable elements in speedy recovery of function.

(b) *Secondary*.—Prévost¹⁰⁰_{Mar. 15} operated on a patient, sixteen years of age, for ununited fracture of the humerus and paralysis of the radial nerve ten months after the injury. The inferior end of the nerve was readily found, but the superior could not be found. The bone-ends were exposed, vivified, and sutured. Five months after the operation the fracture had firmly united, but the paralysis remained. The superior end of the nerve was now found by cutting down upon the radial nerve at the posterior border of the axillary space and following the nerve in a downward direction. The distal end was again readily found and the ends were united by catgut suture. In a short time the young man recovered the full use of the limb.

Professor Helferich, corresponding editor, of Greifswald, sends the report of a case of secondary suture of the musculospiral nerve where the operation was done seven weeks after injury to the nerve by a fracture in the upper part of the humerus, which resulted in a complete cure one year and a half after the operation. The operation was performed by Middeldorpf.

In Roux's case¹⁹⁷_{Dec. 15, '87} the radial nerve had been divided by a revolver-bullet two and one-half months before the operation. Muscles supplied by radial nerve completely paralyzed. Ends of nerve exposed in cicatrix and united with one fine catgut suture. Six weeks after the operation signs of restoration of nerve function. Four months after operation complete recovery.

Marsh⁶_{Apr. 7} operated on a woman, aged twenty-three, who cut her wrist with a broken pane of glass October 5, 1887. The wound healed slowly and sensation was lost over the palm of the hand and over both the anterior and posterior surfaces of the thumb and two adjacent fingers, and partly over the radial side of the ring finger. The paralyzed area became the seat of serious trophic changes. Nerve suture February 8, 1888. The proximal end of the median nerve was drawn to the ulnar side of the tendon of the palmaris longus, was large and bulbous, and joined at an angle by a thin band of fibrous tissue to the atrophied distal end. The ends were resected, placed in good position by stretching the nerve a little and flexing the wrist, and united by three catgut sutures.

Fifteen days after the operation the patient noticed that the thumb and fingers began to "feel different," and two days after this there was a return of sensation over the palm and proximal ends of the thumb and middle fingers. Slow but uninterrupted improvement followed.

Ehrmann¹⁶⁸_{July 1} has collected twenty cases of secondary suture of the radial nerve, with special reference to the final result.

In Lindpaintner's case⁸⁴_{July 10} the ulnar nerve was divided in the axilla seventeen months before the operation of secondary suture was performed. At the time of injury there was free hæmorrhage from the wound, which yielded to compression. The paralysis of the muscles supplied by the ulnar nerve was complete. The nerve was exposed at the site of injury, when it was also ascertained that the source of hæmorrhage must have been a punctured wound of the axillary artery, as a spurious aneurism the size of a cherry was found. The proximal end of the nerve was bulbous, while the peripheral had atrophied so that it presented a thread-like appearance. The nerve-ends were vivified, and after stretching the nerve on either side coaptation and suturing were rendered possible. Primary union of wound. Two weeks after the operation returning sensation showed that the nerve-ends had united. During the second month motion returned also.

(c.) *Nerve Stretching and Nerve Suture.*—After considerable loss of substance it has often been found impossible to unite two nerve-ends on account of the impossibility of effecting approximation by the ordinary methods. For the purpose of placing such nerve-ends in a condition to unite, Assaky has devised the suture *à distance* by furnishing an absorbable bridge for the products of tissue proliferation from the nerve-ends. Schüller¹¹³_{Jan. 29} has recently advocated nerve stretching as a preliminary measure to nerve suture, as by this procedure the nerve is considerably elongated, and thus coaptation of nerve-ends separated at some distance rendered possible. As a text for his most valuable paper, he takes an interesting case, in which he employed this method with signal success. The patient, a young man, wounded himself in November, 1884, in the palm of the right hand, with a piece of glass broken from a bottle which he was corking. The injury was followed by trophic lesions in the course of the nerve below the seat of injury, in the shape of a deep excavated ulcer on the volar surface of the

middle portion of the right index finger, which presented all the appearances of a perforating ulcer. The symptoms pointed to a division of the median nerve, and at the time of operation, May, 1885, this was found to have occurred, and also that a piece of glass was embedded in the imperfect scar at the seat of the wound.

FIG 39.

(See Fig. 39.) The operation consisted in exposing the nerve from the lower part of the forearm to the middle of the palm, excising the scar, removing the fragment of glass, and uniting the nerve-ends, after stretching the nerve on both sides, with fine cat-gut sutures. The wound healed by primary union. The result

of the operation was most satisfactory. So far as the extent to which a nerve may be safely stretched is concerned, Schüller believes, from the result of his experience and of certain experiments which he has made, that a gap of an inch and a half in the main nerves of the extremities can be overcome by this method. Practiced with caution, this method cannot fail to become a valuable aid in many cases of nerve suture.

Nerve Stretching.—Nerve stretching in the treatment of inveterate cases of neuralgia has been frequently performed during the last year by different surgeons and has often yielded satisfactory results. M. H. Richardson⁹⁹ reports a case of nerve stretching for painful muscular contractions of the muscles supplied by the lower intercostal nerves. The patient was a woman, aged forty-eight, who four years ago had severe neuralgic pains in the right side, which lasted for about one year. Two years ago the trouble returned. The pain was attended by severe and uncontrollable contractions of the abdominal muscles on the left side. The attacks returned every few moments. Patient could not walk. As the usual treatment proved of no avail, it was decided to stretch the lower intercostal nerves. An incision five or six inches in length was made parallel to and an inch below the lower border of the ribs on the left side. All the nerves in this incision were divided or stretched. The wound healed in two weeks. There was no marked change for the better, although the frequency of the attacks seemed diminished. It is very probable that the trouble in this case was of central origin, and not in the nerve-trunks themselves. The same surgeon reports two cases of nerve stretching for sciatica. The first patient was a man, aged thirty-six, who had been suffering from sciatica for eight months. The nerve was exposed below the lower border of the gluteus maximus muscle by an incision two and one-half inches in length. The nerve was then forcibly drawn upon two or three times to the extent of raising the limb. Pain diminished next day. No anæsthesia or motor paralysis. Two days after operation pain in the same locality as before operation, but not so intense. Primary healing of wound. A month after operation, pain being still severe, he was etherized, and extension on nerve made by strong flexion of the thigh on the abdomen with the leg and foot extended. The patient left the hospital shortly afterward without being benefited in the least by

either operation. The second case was a man, aged fifty, who fifteen years ago received a blow over left buttock with a pick. Three months after began to suffer from sciatic neuralgia. This pain has continued, but with little severity and frequent intermissions, ever since. The last six months the pain has been more severe and constant. Bloodless nerve stretching was done, while the patient was fully under the influence of ether. Only slight improvement.

Southam¹⁰⁷_{Mar. 15} performed stretching of the sciatic nerve in two cases of central lesion of the spinal cord. The first case was a man, thirty-six years old, suffering from well-marked lateral sclerosis of the cord. The patient presented the characteristic spastic gait; the patellar reflex and ankle clonus were much exaggerated. Muscles of lower limbs rigid and reflex activity augmented. No atrophy and no loss of sensation. For the purpose of relieving the lightning pains in the limbs the left sciatic nerve was exposed and stretched, just below the spot at which it emerges from beneath the lower border of the gluteus maximus, sufficient force being employed to raise the limb from the horizontal position, and traction being also made in both an upward and downward direction, so as to bodily move the patient upon the operating-table. Patellar reflex and ankle clonus disappeared in the limb. No loss of sensibility, but spastic contractions of muscles of the left thigh and leg were somewhat diminished. On the second day the shooting pains in the abdomen and both lower limbs suddenly ceased. In the course of two weeks ankle clonus and patellar reflex began gradually to re-appear, and very soon re-asserted themselves with almost all their former severity. Six weeks later the pain had not returned, the movements of the left limb were still much freer than those of the opposite side, and the patient felt greatly relieved. The second patient was a man, aged fifty-one, the subject of locomotor ataxia of three years' standing. He complained of severe shooting pains in the abdomen and down the lower extremities, also of girdle pains at the level of the umbilicus. On July 18th the left sciatic nerve was exposed and stretched, as in the preceding case. The operation was not at first attended by any apparent result; no loss of sensation nor of muscular power was produced, nor was it for a time followed by any relief from pain. After about two days, however, the shooting

pains in both legs began gradually to disappear and he left the hospital five weeks later greatly relieved, but the remaining symptoms due to the central lesions continued unabated.

A case of death from traumatic sepsis following stretching of the sciatic nerve is reported by McArthur.²³¹_{Sept.} The patient had suffered from sciatica for five or six years. The operation was performed under the usual antiseptic precautions, but the temperature rose within a few hours to 103° F. (39.5° C.), and, in spite of antipyrin, opening of the wound, and secondary disinfection, the patient died of sepsis in less than forty-eight hours. The source of infection could not be ascertained. The catgut used was inspected, but implantation experiments showed that it was aseptic.

Maclean²³⁴_{Feb.} stretched the sciatic nerve for obstinate neuralgic pains in a man aged thirty-eight. The disease had lasted over a year and was not influenced by different kinds of treatment. The nerve was stretched with a force sufficient to raise the whole limb from the table several times. Wound suppurated. Felt no pain since operation, and six weeks later the pain had not returned.

Page²_{Feb. 4} reports a successful case of nerve stretching for spasmodic torticollis, following injury to the cervical spine. A young healthy man while playing football was thrown, and fell heavily on his back, twisting his neck violently to one side. He was unconscious and lost the use of his limbs; during the night regained the use of his legs. The paralysis of upper limbs lasted two weeks. In two months he recovered sufficiently to resume work. A month later he struck his head violently against an iron pipe. On rising he found his neck twisted as it had been two days after the former accident. The twisting resulted from a tonic contraction of the right sternomastoid and trapezius muscles. Any attempt to straighten the head caused violent spasms of the muscles named. As all other treatment proved useless, the spinal accessory was stretched six months after the accident. The nerve was exposed where it emerges from the sternomastoid on its way to the trapezius muscle; the clonic spasms disappeared within a few days, and when the patient left the hospital, soon afterward, only a slight rigidity of the muscle remained.

Neurectomy.—Albrecht⁹⁸_{Aug.} has recorded one case of resection of motor and ten cases of resection of sensory nerves. Of the latter cases seven were males, three females. All were operated

on for neuralgias seated in the trigeminus: supraorbital, one; infraorbital, four; mandibularis, four; lingual, one; buccinator, one. These eleven neuralgias required fifteen operations. A favorable result was obtained in all cases, but of varying duration. Two patients up to date are permanently cured. The remainder were attacked with a return of the painful malady at periods varying from six months to three years.

Dr. Bayer (corresponding editor), of Prague, describes a case of nerve section where the operation was done without causing pain by injecting one gramme (fifteen grains) of a 5 per cent. solution of cocaine. The nerve operated on was the infraorbital, and the solution was injected into the tissues within and around the canal. The needle served as a guide to a small tenotome, which was introduced into the canal and the nerve divided several times. At the same time the facial nerve was divided subcutaneously. The neuralgia was cured.

M. H. Richardson⁹⁹ operated on a recurring neuralgia of the inferior dental nerve. Neither inferior dental canal nor nerve could be found, but from the mental foramen the nerve was found emerging enormously enlarged; its branches were collected together and pulled out of the canal, and also from the tissues to which it was distributed, the foramen was chiseled out, and the nerve destroyed a considerable distance. A good result was obtained. The same author reports a case of neurectomy for spasmodic torticollis. The patient was a woman, aged forty-eight, who for four years had suffered from contraction of the right sternocleidomastoid and trapezius muscles. This was not constant at first, but very painful. The head was drawn to the right and rotated slightly. Electricity and various apparatus had been used without success. At the time of operation the right sternocleidomastoid was rigid and permanently contracted. An incision one inch long was made over the nerve along the anterior border of the muscle. The dissection was carried backward toward the vertebræ. The nerve was easily found and an inch of it excised. The diagnosis was verified by the electric current before the nerve was divided. In two days sutures were removed, and the muscle was found soft and flexible. The head was erect, and there was no pain. The trapezius muscle, which was in a contracted condition, was later stretched by an apparatus. Section of the spinal

accessory does not completely paralyze the muscle, as it receives also filaments from the cervical plexus. The ultimate result in this case was satisfactory. J. Collins Warren recommends an incision through the sternocleidomastoid muscle near its posterior border for operations on the spinal accessory nerve.

Pye-Smith,²_{Feb. 4} showed to the Sheffield Medico-Chirurgical Society a man, aged thirty-nine, in whom he had divided the right spinal accessory nerve for severe convulsive wryneck. The spasms had almost entirely disappeared, enabling the man to resume work. The sternocleidomastoid and trapezius muscles were much wasted.

Hume,²_{Mar. 17} removed a fibrosarcoma of five months' growth which occupied the greater part of the back of the thigh. At the operation it was ascertained that the tumor was incorporated with the sciatic nerve; the nerve was divided high up and the tumor enucleated. A portion of the nerve had to be excised. After the wound healed the patient could walk, and the operator thought that he would retain this power, judging from his experience of another case similarly treated.

Calignani,¹³⁶_{Mar.} at the meeting of the Congress of Italian Physicians in 1887, advocated resection of the inferior dental nerve through an incision made half way between the lobe of the ear and the angle of the inferior maxillary bone. He divides the tissues down to the bone and reflects the periosteum with the remaining soft tissues and thus exposes the nerve, which is then excised. Bottini favors the intraoral method as devised by Parravicini, except in special cases where it is impossible or inadvisable to operate through the mouth.

Salzer,⁴¹_{Apr. 23} makes a semilunar incision extending from the anterior to the middle portion of the zygomatic process, dividing the skin, fascia, and temporal muscle down to the bone, with temporary resection of the temporal bone made as close as possible to the temporomaxillary joint. From the crista of the temporal bone the soft tissues are detached as far as the anterior wall of the joint, which are retracted as far as possible so as to expose the nerve fully. The division of the third branch of the trifacial nerve at the foramen ovale has so far been done only in a few cases. In two cases operated upon by this method by Salzer, no recurrence had taken place after five, and in the other after ten, months. Schlange

stated that he had operated on two cases by the same method, and was well pleased with the operation and its results. (See Section K, this volume.)

SURGERY OF THE ABDOMEN.

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Diagnosis.—The literature of the surgery of the abdomen has been enriched during the past year by valuable contributions upon diagnosis and treatment. Among these contributions, that of Senn upon “Insufflation of Hydrogen Gas an Infallible Test in the Diagnosis of Visceral Injury of the Gastro-Intestinal Canal in Penetrating Wounds of the Abdomen” ⁶¹_{June 24, 30} stands pre-eminent and commands recognition by its practical value in determining the existence of perforating wounds of the gastro-intestinal canal. By a series of careful experiments upon the human subject and upon dogs, he found that air or gas could be forced, under light pressure and without the production of injury, through the whole alimentary canal from anus to mouth. Having determined this fact, he extended his researches, and proved that in perforating wounds of the gastro-intestinal canal the gas would escape through the abdominal wound and manifest its presence by ignition. This was demonstrated upon dogs in a state of anæsthesia, inflation of the intestines having been effected after the infliction of gunshot-wounds of the abdomen. Insufflation of hydrogen gas is accomplished readily in the following manner: After thorough disinfection of the external wound or wounds and the field of operation, the patient should be placed completely under the influence of an anæsthetic for the purpose of relaxing the abdominal muscles, which greatly facilitates the inflation. In the absence of a Wolf bottle, hydrogen gas can be readily generated in a large, wide-mouthed bottle into which a small handful of chips of pure zinc is placed. The mouth of the bottle is closed with a cork with two perforations, through which two glass tubes are inserted, one for the purpose of pouring in water and sulphuric acid, and the other, which should be bent nearly at right angles, for leading away the gas. A rubber balloon holding sixteen litres of gas is attached to the bottle by a rubber tube. The rubber tube connecting the

(B-1)

balloon with the rectal tip of an ordinary syringe should be interrupted by a stop-cock, so that the escape of gas can be prevented when inflation is temporarily suspended. The return of gas along the sides of the rectal tip can be readily prevented by an assistant pressing the anal margins firmly against it. The inflation must always be made *slowly*, as *long-continued*, *uninterrupted pressure accomplishes most effectually lateral and longitudinal dilatation of the cæcum*, conditions which render the ileo-cæcal valve incompetent, and which must be secured before inflation of the small intestine is possible. The entrance of gas from the colon into the ilium is always attended by a diminution of pressure, and its occurrence can invariably be recognized by a gurgling or blowing sound over the ileo-cæcal valve, the sounds being sometimes sufficiently loud to be heard at some distance. If after inflation abdominal distention and tympanites be, from the very first, diffuse, and liver dullness has disappeared, it is a certain indication that it is due to the presence of gas in the peritoneal cavity, and not to distention of the gastro-intestinal canal. If, on the other hand, this distention and tympanites follow the course of the colon, and, after the entrance of the gas through the ileo-cæcal valve, is circumscribed and limited to the umbilical and hypogastric regions and gradually extends to the upper portion of the abdomen, and *the liver dullness is displaced upward*, it is in all probability caused by a gradual and successive inflation of the intact bowel in an upward direction. In some penetrating wounds of the abdomen it is difficult, if not impossible, to follow the course of the bullet through the abdominal wall with a probe or finger, on account of a relative change of position of the different layers of tissues in the track of the bullet obliterating the canal, but even in these cases a moderate distention of the peritoneal cavity will force bubbles of gas through the tortuous course of the bullet, and by this sign the surgeon may know positively that some portion of the gastro-intestinal canal has been perforated. In order to prove that the bubbles which escape are part of the hydrogen gas which has been inflated, a lighted match or taper may be applied, and if it is hydrogen gas it will ignite with a slight explosive report and burn with a characteristic blue flame. Should the external wound prevent the escape of gas from the peritoneal cavity, by sliding of the different layers of tissue of the wound in

the abdominal wall or by the pressure of a coagulum in the track made by the bullet, it becomes necessary to secure a sufficient degree of patency of the wound for the escape of gas by careful probing or the removal of coagulated blood. The finding of perforation is also greatly facilitated by inflation, as the bowel below the lowest perforation will always be found at least slightly dilated by gas. If the existence of other perforations is suspected, the inflation can be repeated, the bowel becoming distended to these points. In this manner the entire canal can be examined, and the little manipulation required avoids one of the great sources of danger in the operative treatment of wounds or perforations of the gastro-intestinal canal. The moderate distention of the intestines remaining after treatment of the visceral wounds never interfered with the return of the intestines into the abdominal cavity or the closure of the external wound in any of the experiments. The numerous observations made in reference to the disappearance of the gas by absorption or escape through the natural outlets are conclusive, in showing that the distention due to the presence of gas disappears in a remarkably short time. It can, therefore, be safely stated that the rectal insufflation of hydrogen gas in the diagnosis and treatment of penetrating wounds of the abdomen does not interfere with an ideal healing of the visceral and laparotomy wounds. In conclusion, Dr. Senn submits the following propositions:—

1. The entire alimentary canal is permeable to rectal insufflation of air or gas.

2. Inflation of the entire alimentary canal from above downward through a stomach-tube seldom succeeds, and, therefore, should be resorted to only in demonstrating the presence of a perforation or wound of the stomach, and for locating other lesions in the organ or its immediate vicinity.

3. The ileo-cæcal valve is rendered incompetent and permeable by rectal insufflation of air or gas under a pressure varying from one-fourth of a pound to two pounds.

4. Air or gas can be forced through the whole alimentary canal from anus to mouth under a pressure varying from one-third of a pound to two pounds and a half.

5. Rectal insufflation of air or gas, to be both safe and effective, must be done very slowly and without interruptions.

6. The safest and most effective insufflator is a rubber balloon large enough to hold sixteen litres of air or gas.

7. Hydrogen gas should be preferred to atmospheric air or other gases for purposes of inflation in all cases where this procedure is indicated.

8. The resisting power of the intestinal wall is nearly the same throughout the entire length of the canal, and in a normal condition yields to diastaltic force of from eight to twelve pounds of pressure. When rupture takes place it either occurs as a longitudinal laceration of the peritoneum on the convex surface of the bowel, or as multiple ruptures from within outward at the mesenteric attachment. The former result follows rapid, and the latter slow, inflation.

9. Hydrogen gas is devoid of toxic properties, non-irritating when brought in contact with living tissues, and is rapidly absorbed from the connective-tissue spaces and all of the large serous cavities.

10. The escape of air or gas through the ileo-cæcal valve from below upward is always attended by a blowing or gurgling sound, heard most distinctly over the ileo-cæcal region and by a sudden diminution of pressure.

11. The incompetency of the ileo-cæcal valve is caused by lateral and longitudinal distention of the cæcum, which mechanically separates the margins of the valve.

12. In gunshot or punctured wounds of the intestinal canal, insufflation of hydrogen gas enables the surgeon to demonstrate positively the existence of the visceral injury without incurring the risks and medico-legal responsibilities incident to an exploratory laparotomy.

O. Minkowski⁴_{Nov. 31},⁵_{Oct.} has made valuable additions to our knowledge with regard to the diagnosis of abdominal tumors by investigations pursued during the past two years, conducted upon patients with abdominal tumors, by distending the stomach with carbonic acid gas at one time, and observing the changes in position which the tumors undergo, and noting the conditions at another time, when the large intestine was filled with water. The methods of the examination employed are as follow: The position of the tumor being first determined accurately with the stomach as empty as possible, distention of the stomach is obtained by means of the

gas produced by the administration of carbonate of soda, followed by tartaric acid. The position of the tumor is now accurately fixed and the gas removed by introduction of the stomach-tube. The large intestine is now filled with water and the position of the tumor again determined accurately. In this manner one hundred and ten abdominal tumors were submitted to examination, and it was ascertained that on distention of the stomach or intestine the tumors showed a tendency to move toward the region normally occupied by the organs in which they were developed. The following conclusions were arrived at:—

1. Tumors of the liver move *upward* and to the *right* when the stomach is distended with gas. On filling the intestine the growth moves *upward simply*—sometimes slightly to the right or left.
2. Tumors of the gall-bladder follow much the same rule as applies to those of the liver.
3. Tumors of the spleen move to the *left* and often slightly *downward* on distending the stomach. On distending the colon they move *upward* and usually to the *left*. Movable tumors of the spleen, which have left the normal position, tend to resume it when the stomach, and especially the intestine, is dilated, and to produce again the splenic dullness which had been absent. The filling of the stomach with gas is a very valuable means of distinguishing between an enlarged left lobe of the liver and an enlarged spleen.
4. Tumors of the stomach can often be recognized at once when the stomach is inflated. In other cases the fact that the growth becomes broader, the boundaries more indistinct, the percussion sound more tympanitic, and isolated nodules more widely separated from each other, indicates that the growth belongs to the stomach. Circumscribed tumors in the region of the pylorus usually move to the right and *downward*. Tumors of the transverse colon and of the omentum also often exhibit the same change of position when the stomach is inflated, but in many cases the growths of the stomach can be distinguished by the fact that they move in an *upward* direction when the colon is filled with water. Growths of the lesser curvature usually move *upward* and disappear *backward* when either the stomach or colon is distended, but they are subject to other changes of position.
5. Tumors of the colon are often easily recognized, becoming broader when the intestine is filled with water. Tumors of the transverse colon move *upward* on inflation of the stomach, but *downward* on

distention of the colon. It is to be noted, however, that growths of the intestine often offer the greatest difficulty in their recognition. 6. Tumors of the omentum are displaced *downward* by the inflation of the stomach, and *downward* and *strongly forward* by the filling of the intestine. 7. Tumors of the kidney are not materially affected by inflation of the stomach, but move *upward* on distention of the colon, are felt with difficulty, and then almost always disappear. If the abdominal walls are flaccid, the intestine filled with water can often be quite easily traced in its course over the tumor. If the kidney is not in its normal position, as is so often the case, the injection of water into the intestine will usually push it into its proper place. Very large renal tumors do not entirely disappear in this way, but are very distinctly pressed *outward* and *backward*. 8. In a case of tumor of the pancreas, the growth acted much as did those of the kidney, except that on distention of the stomach there was slight displacement to the *right*. 9. Tumors of the ovary are moved by the full intestine *forward*, a little *upward*, and to the side to which the diseased organ belongs.

In conclusion, the author calls attention to the importance of inspection of the patient from behind in the investigation of the abdominal tumors. Tumors of the liver or spleen will show a prominence at the lower part of the thorax, and those of the kidney, if of considerable size, at the middle of the lumbar region. Very often in the case of a growth of the kidney there will be a depression or diminished resistance of the soft parts in this region, which will be replaced by an evident projection when the colon is filled with water. This is one of the most constant symptoms of movable kidney or movable renal tumors. Tumors of the liver, spleen, and intestine, as well as of the kidney, may be detected by bimanual examination. Distention of the colon with water will assist bimanual examination in the detection of growths of the kidney. The displacement of abdominal tumors by respiration is not to be depended upon as a diagnostic sign, since growths of all of the viscera may move during respiration. The tumor may be fixed from outside during inspiration and its mobility thus determined. This manœuvre may aid in diagnosis in the case of all organs except the liver, in which the movement upward during expiration cannot be thus prevented.

We have given the foregoing space to the consideration of the subject of diagnosis, feeling that its importance demands the fullest discussion. The value of knowledge which in any way contributes to the perfection of diagnosis in affections of the abdomen requiring surgical interference cannot be overestimated. Improvements in methods of diagnosis must go hand-in-hand with improvements in methods of treatment. In this way only can the surgery of the abdomen maintain the high position it has attained and add in the future to its long list of brilliant achievements.

TYMPANITES.

A. Wilkinson²_{Apr. 23} states that he has resorted to puncture of the abdomen in tympanites several times during the past thirteen years. He recites the first case in which he performed the operation, the patient at the time being in a critical condition due to great abdominal distention. A hypodermic needle was employed, immediate relief was afforded, and the patient passed on to convalescence. In the other cases treated in this manner no unfavorable results occurred from the procedure.

Dr. B. Farquhar Curtis,¹⁰¹_{July} in a paper before the New York Clinical Society, called attention to the danger of the occurrence of faecal extravasation in puncture of the bowel in tympanites. He stated that there is less danger if the intestine is not distended, as might happen when an abdominal abscess is suspected and punctures are made to disclose its position. The paralysis of the muscular coat in a case of overdistention of the intestine would interfere with the closure of the wound and permit the extravasations of the contents. In peritonitis the layers of lymph upon the intestinal surfaces would stiffen the walls and prevent contraction of the punctured wound. If adhesions existed between the intestine and the abdominal wall the danger would be removed, and it would also be much lessened if adhesions were present between the adjacent coils of intestine which would thus limit the extravasations which might occur. The danger is greatest in extreme and long-continued distention of the intestine without the occurrence of peritonitis. Dr. Curtis thought the operation should be restricted to cases of extreme tympanites in which the patient will succumb to the pressure of the distended intestine upon the diaphragm unless immediate relief is afforded.

J. Chris Lange^{161 Feb.} discusses the character of cases in which puncture of the intestine for tympanites should be performed, whether it should be employed as a *dernier ressort* or as a remedial measure, describing the form of instrument which should be used, and recording eight cases in which he afforded great relief by its employment. In certain rare cases, he states, of many and diverse pathological conditions and processes, tympanites becomes that factor of disease which most threatens a rapid and fatal ending, by the mechanical pressure of the intestine, distended by the gas, upon the heart and lungs, interfering with contractions of the heart and diaphragm. With regard to the danger of inducing or diffusing peritonitis by the traumatism of this operation, the author believes it to be so infinitely small that its consideration should not weigh when the operation is indicated. The possibility of inducing a septic peritonitis or of transforming a fibro-serous or adhesive to a septic form of inflammation, by extravasation of the intestinal contents during the withdrawal of the instrument, he thinks may be avoided by the use of an instrument possessing that conformation which would best compel a tight hug by the intestinal tissues, this embrace wiping the instrument clean at the inner surface of the bowel and preventing the deposition of intestinal contents upon the peritoneum as it is withdrawn. In his operations the writer employed the smallest needle of a Dieulafoy aspirator.

ASCITES.

Chylous Ascites.—At the meeting of the French Surgical Association, Terrillon^{91 Aug. 10} reported a case of chylous ascites occurring in a woman thirty-eight years old, who, eight years before, had noticed an enlargement of the abdomen, and since that time had suffered progressive and rapid emaciation. Under the belief that an ovarian cyst existed, paracentesis was performed two years and a half ago, and a light chocolate-colored fluid was evacuated which was neither ascitic nor ovarian. Another puncture was made later and a fluid of the same character withdrawn. The patient coming under the care of Terrillon, he made an examination and detected a large ascitic effusion with a periuterine swelling. Considering the age of the patient and her emaciation, he thought it to be papilloma of the pelvis and decided to make an exploratory operation. The incision evacuated eight litres of a fluid resembling

chyle and histologically constituted like a true fatty emulsion. When the fluid was removed the peritoneum was found to be reddened and velvety and bled easily. There was no other lesion except a uterine myoma the size of a walnut. The abdomen was closed, the patient recovered, and the fluid very quickly reaccumulated. It is interesting to know that this form of ascites, which existed for eight years without profound involvement of the general health, did not accord in this respect with the well-known facts with regard to chylous effusion. The pathology of these effusions was discussed, some attributing them to rupture of the lymphatic vessels, as was found in a case reported by Strauss. Others, with Debove and Nil, believed the fluid to be altered pus. Terrillon had observed a case of encysted peritonitis in which the fluid resembled that in chylous ascites. The absence of fat determined the fact that the fluid was not chylous in character.

CHYLOUS CYST OF THE MESENTERY.

Unjenin and Petroff^{636, 25}_{Nov. 7, 8; Aug. 20} record an interesting case of chylous cyst of the mesentery, in which laparotomy was successfully performed by Fenomenoff. The patient, a woman, aged twenty-six, was admitted to the clinic with a painless, freely movable, smooth, elastic, globular tumor, of the size of two male fists, occupying a position two finger-breadths below and slightly to the right of the umbilicus. The diagnosis of an ovarian cyst with a long pedicle was made and laparotomy was performed. On opening the abdomen the cyst was found to be situated between the layers of the mesentery of the small bowel. On puncture, two teacupfuls or more of milky fluid was ejected. The cyst was enucleated, the mesenteric folds being sutured together and partially removed. The abdominal cavity was washed out with a 2 per cent. solution of borax, the wound closed with three deep wire and seven superficial silk sutures, and dressed with iodoform gauze. Drs. Unjenin and Petroff believed, from the careful microscopical examination of the tumor, that it resulted from a degenerated lymphatic gland. It is the first case of a mesenterial chylous cyst in Russian literature. A critical examination of international literature discovered the records of nine similar cases, in five of which laparotomy was performed, with four recoveries and one death. A brief outline of each of the recorded cases is given by the authors. The absence,

in these cases, of any reliable differential signs renders the diagnosis always difficult, and it may even be said impossible. In the six cases subjected to operation, the diagnosis was not determined prior to operation. The most rational treatment is laparotomy with extirpation, or, if this is impossible, incision, suture to the abdominal wound, and drainage of the cyst.

CYST OF THE MESENTERY.

Coppens reports,¹⁴ a case of cyst of the mesentery on which laparotomy was performed by Folet. The patient, a woman, aged forty-three, entered the hospital August 12th, suffering from a voluminous tumor of the abdomen which had been noticed first last April. The tumor resembled in all of its features a monocystic growth of the ovary, and the diagnosis was made to this effect. On opening the abdomen it was found that the tumor was situated in the mesentery. Efforts at enucleation were abandoned, the cyst was opened, and from seven to eight litres of yellow fluid evacuated. The opening in the cyst-wall was closely sutured to the incision in the abdominal wall. In this manner good drainage was secured. Recovery took place without interruption, and by the 18th of November a small sinus, four centimetres and a half in depth, remained.

Dr. Coppens reviews the subject of mesenteric cysts and records the cases thus far published. Sir Spencer Wells regarded them as extremely rare, having encountered but two in his extended experience. Péan relates three cases in which mesenteric cysts were mistaken for cysts of the ovary. Of these, one cyst was drained, with recovery of the patient, and two were extirpated with fatal results. Buckner reports a case in which, notwithstanding the extensive separation of the mesentery and intestine in successful efforts at enucleation, the patient recovered completely. Lawson Tait saved a patient suffering from a cyst of similar nature by drainage. Carter, through mistaken diagnosis, as in all of the reported cases, opened the abdomen and found a cyst of the mesentery which he was unable to remove safely. It was drained, but the patient died on the sixteenth day from septicæmia. Coppens discusses at some length the differential diagnosis between ovarian or parovarian cysts and mesenteric cysts, and also their evolution. He sums up the methods of treatment employed and finds that

incision and drainage is the only operation which should be performed, as the results in the seven cases reported give two deaths out of three cases of enucleation, and one death out of four cases in which incision and drainage were employed.

Cornelius Kollock,⁸¹ records a case of supposed mesenteric cyst in which laparotomy was successfully performed. The patient, a boy aged fourteen, had been run over some two years previous to the operation, the wheels of a heavy wagon passing obliquely over the body, contusing the skin and muscular tissues of the abdominal wall very severely. In the course of a month the signs of the injury had disappeared, but the general health began to fail, and there was marked fullness of the abdomen in the region of the part injured. At the time of the operation the swelling was quite distinct, conical in shape, and inclined to the right side. The cavity of the abdomen was opened by an oblique incision three inches in length, extending from a point over the pyloric orifice of the stomach toward the umbilicus. The tumor was covered by the omentum, which was slightly adherent to the abdominal wall and to the surface of the tumor. It was attached by a thick, broad, and short pedicle an inch and a half in length to the right side of the vertebral column a short distance above the kidney. The pedicle contained large blood-vessels and lymphatic glands. The cyst was evacuated by the trocar, the fluid being thick, dark, and greasy-looking; with an admixture of pus and apparently bloody serum. The pedicle was clamped prior to section, the divided vessels ligatured, the abdominal cavity cleansed with hot carbolized solutions, the incision closed with silver-wire sutures and dressed with salicylated cotton and compress, held in place by adhesive strips. Recovery took place promptly. Kollock very justly attributes the origin of the tumor to the accident, but is in doubt as to the exact nature of the growth. He says that it "seemed to be an exudation cyst, composed of double folds of peritoneum, lined with a fluid-secreting membrane, which was rough, corrugated, and thick, resembling the inner walls of the gizzard of a fowl."

COLLOID CARCINOMA OF THE PERITONEUM.

Ferguson exhibited at the meeting of the New York Pathological Society, March 14, 1888, an immense colloid carcinoma of the peritoneum which he had removed post-mortem from the body

of a male patient, fifty-one years of age, in the New York Hospital. Three years before admission swelling of the abdomen began and continued without interruption. At the time of admission it measured one hundred and five centimetres in circumference at the level of the lowest ribs. Examination showed the presence of a large, firm, unyielding mass, tender on pressure. A number of smaller tumors could be detected, situated just beneath the abdominal wall. The superficial abdominal veins were not unusually prominent. Exploratory laparotomy was performed with a view to determine the character of the tumor and the possibility of its removal. On opening the abdomen fluid and colloid material escaped. The effort to remove the tumor was abandoned, and two days later death ensued. The autopsy showed that the entire peritoneum, both visceral and parietal, was infiltrated with nodular tumors of a pale, translucent material. The omentum and peritoneal covering of the stomach and intestines were infiltrated with tumor masses. The omentum measured twenty-five centimetres in length, forty-five centimetres in width, and seven centimetres in thickness. The mesentery was ten centimetres thick in parts. On microscopic examination the masses were found to consist of a fibrous stroma, containing large alveoli lined with epithelial cells undergoing colloid degeneration

HYDATID CYST OF THE PERITONEUM.

Sidney Jones⁶_{Aug. 25} reports a case of hydatid cyst of the peritoneum occupying the mesocolon. The tumor, the size of a small orange, caused the patient great anxiety and serious inconvenience, and for these reasons it was removed by laparotomy. The patient made a prompt recovery.

In a case of hydatid tumor of the omentum occurring in a pregnant woman, laparotomy was successfully performed by George E. Rein.²⁵_{Aug. 15} The patient, aged twenty-five, was admitted to the clinic in the third month of her pregnancy, with complaints of severe pain about an abdominal tumor which had been first noticed by her about six years before admission. On examination under chloroform there was found an extremely movable, elastic, fluctuating, knobby, ovoid tumor measuring 9 by 7.8 centimetres. Its position was in the region of the umbilicus, but it could be moved easily under the ribs on either side or down to the inlet of the pelvis.

The nature of the tumor was doubtful, it being supposed to be either a cyst of the ovary with a long pedicle or a mesenteric or omental growth. Laparotomy was performed, a median incision to the extent of twelve centimetres, six above and six below the level of the umbilicus, being made. The tumor was found to have its origin in the omentum, and was extracted through the incision without diminishing its size by puncture. The pedicle, formed of a portion of the omentum and not very vascular, was divided into two portions, ligatured, and returned to the abdomen. The cyst contained numerous smaller cysts floating in the characteristic hydatid fluid. The maternal cyst was unilocular. On the twentieth day following the operation the patient was discharged well, her pregnancy advancing toward its normal termination.

Professor Rein discusses the question of diagnosis in the sixteen cases of laparotomy for so-called hydatids of the abdominal cavity which have been recorded, and states that the origin of the cyst in two was most probably in the omentum. Single hydatid cyst of the abdominal cavity is rare, the occurrence of multiple cysts being the rule. Exploratory puncture is regarded as dangerous, death having occurred in two cases of pelvic hydatid cysts after such operation. In order to prevent escape of the contents of cysts into the abdominal cavity, the tumors should be removed entire, without puncture to diminish their size, the incision of abdominal walls being increased if necessary to accomplish this. Pregnancy, he states, does not contra-indicate any laparotomy, including that for removal of abdominal echinococcus.

At a meeting of the East Siberian Medical Society, Astashovsky⁵⁸⁶_{No. 12, July 20}²⁵ reported a case of hydatid cyst of the omentum. In this case the abdomen was opened, the cyst, attached to the abdominal wall, incised, emptied of its contents, washed out with boracic solution, and drained. On the fifty-second day the patient was discharged with a small sinus, which, three months later, was completely closed.

PERITONITIS.

Many valuable contributions have been made upon treatment by laparotomy of the various forms of peritonitis. Increased experience has demonstrated beyond question the value of surgical interference in the suppurative form, whether following the so-called idiopathic variety, operations, or due to extravasation as the result

of visceral perforations. The propriety of surgical interference in acute serous peritonitis, which, for want of a better term, has been designated the idiopathic variety, arising from an attack of enteritis or indigestion, exposure to cold, or associated with inflammatory conditions of the uterus or appendages, may still be said to be undecided. Evidence is not wanting of the successful results obtained by medical treatment, especially in the use of saline purgatives, in such cases causing interference with the progress of the inflammatory process to the stage of suppuration. Cases of this character require the most careful observation in order that the progress of the inflammatory process may be noted and surgical measures instituted as soon as suppuration occurs. The simplest view which can be taken of the suppurative form, so far as relates to treatment, is that which regards a collection of pus in the cavity of the abdomen in the same light as in any other part of the body. The indications are always to evacuate the pus, to cleanse the cavity, and, if necessary, secure drainage. The treatment of the cause, if a cause is present, is, of course, associated with and included in the operative procedures.

Purulent Peritonitis.—R. T. Smith,^{6,11} reports a case of encysted serous peritonitis, followed by acute purulent peritonitis, which was successfully treated by abdominal section, irrigation, and drainage. The patient, a woman, aged twenty-three, came into the hospital under Dr. Smith's care with marked abdominal tumefaction, which had existed for nearly ten years, dating from a severe attack of inflammation of the bowels. She gave a history of menorrhagia and dysmenorrhœa of a severe form. A careful examination under ether detected the presence of fluid in the cavity of the abdomen. The manipulations of the abdomen in this examination provoked acute inflammation in the already inflamed peritoneum, as indicated by rigors, elevation of temperature, vomiting, scanty micturition, and great abdominal distention. Laparotomy was at once decided upon and performed, removing twenty-one pints of thick, dark-brown fluid, with much pus in it. The abdominal cavity was freely washed out with carbolized water and a glass drainage tube inserted. The abdomen below the level of the umbilicus presented the appearance of a large abscess cavity, the small intestines were pushed upward, the pelvic viscera pressed close against the adjoining walls. During the operation the bladder

was observed to undergo distention, and at the conclusion sixteen ounces were withdrawn, the secretion the day before being but twelve ounces. In the twenty-four hours following the operation more than six pints of urine were evacuated, and for two weeks the average was three pints daily. The temperature became normal, and the patient's general condition improved greatly. On the thirteenth day after laparotomy the glass tube was removed and one of rubber substituted. The discharge now became scanty and offensive, notwithstanding a 1 per cent. solution of carbolic acid was used twice daily in washing out the abdomen. The temperature rose and the patient complained of faintness and nausea. The drainage tube was taken out and the cavity freely washed out with a solution of boroglyceride, removing many decomposed flakes of lymph. In a short time the discharge, under the boroglyceride irrigation, became freer and non-offensive. In a month after the operation the patient was able to sit up, and two weeks later was sent to the seaside, a small rubber drainage tube about four inches in length being in position in the sinus which now remained. The sinus was injected with a solution of nitrate of silver, two grains (0.13 gramme) to the ounce (31 grammes), and gradually closed. Palpation showed that the intestines were adherent, in parts forming semisolid bands. At the end of six months the patient had entirely recovered; the abdomen was soft and natural in contour and resilience. No matted coils of intestines could be detected.

E. H. Bradford⁹⁹_{Oct. 18} related to the Boston Society for Medical Improvement a case of purulent peritonitis occurring in a child which was relieved by laparotomy. The child entered the hospital with an enlargement of the abdomen, which was thought to be due to tubercular peritonitis. Aspiration revealed the presence of pus, and laparotomy was performed, removing two quarts of thick pus. The character of the fluid indicated the presence of purulent and not of tubercular peritonitis, as the fluid in the latter was serous, with masses of tuberculous matter floating in it. After evacuation of the pus, a drainage tube was carried into the pelvis and the cavity washed with one to ten thousand corrosive sublimate and hot water. At the end of five days the contents ceased to be purulent and a serous fluid escaped. At the end of two weeks the patient was out of bed. At the date of the report a small drainage tube was in the sinus which existed at that time. A small

piece of the peritoneum was removed when the incision was made and was submitted to examination, but no tubercles were detected.

In a case of purulent peritonitis in a child, eight years of age, under the care of Dittmer, of Berlin, ⁴_{No. 44;} ¹⁴⁹_{Feb.} in which laparotomy was performed and six quarts of healthy pus were evacuated, under free drainage and antiseptic dressings the patient recovered promptly. A sinus which remained for some time after the operation was closed finally under the influence of injections of tincture of iodine.

At the meeting of the West London Medico-Chirurgical Society, held November 2d, Keetley ⁶_{Nov. 24} described a case of purulent peritonitis occurring in a child, aged eleven, after an attack of scarlatina, the immediate cause being kicks upon the abdomen which had been inflicted two weeks before the operation of laparotomy was performed. Pus was evacuated, warm solutions of corrosive sublimate (one to five thousand) were used to wash out the cavity, and a rubber drainage tube, with two large pieces of iodoform gauze to act as syphon drains, were carried into Douglas' *cul-de-sac* and the right iliac fossa. Moist iodoform gauze with wood-wool was employed as a dressing. Recovery was complete in two months after admission into the hospital. Slight delirium for three days, apparently from iodoform poisoning, occurred. The full reports of these cases are given in order to bring clearly into view the good results which follow surgical interference in peritonitis of this form.

Tubercular Peritonitis.—Among numerous contributions upon this interesting subject during the past year, that which must be regarded as among the most important is the paper presented by Hermann Kümmell, of Hamburg, ⁸⁴_{Feb. 25, Mar. 3} at the meeting of the Congress of Surgeons held in Berlin. In this paper he tabulates forty cases, including two under his care which had been treated by operation, and records the results. Out of the entire number but two died as a direct result of the operation, the remaining recovered promptly and the duration of the cure varied from a few months to twenty-five years. In some of the cases in which there was co-existing pulmonary tuberculosis, death occurred within a year. In others of the same class the ascites did not return, although the pulmonary trouble was still present when the report was made. In still others the lung trouble subsided. After the operation the

majority were restored to comparatively good health, free from ascites, and with a positive and marked increase in flesh. Females presented the larger number of cases, and the ages varied from four to fifty-six years. The diagnosis was made in a few of the cases, and in them the operation was performed as a remedial measure. In some it was performed to decide a doubtful diagnosis. In Kümmell's two cases the condition was discovered incidentally, the abdomen having been opened for the relief of ileus. In the greater number of cases laparotomy was performed through an error of diagnosis, the swelling being mistaken for simple ascites, ovarian cyst, or abdominal tumor. The physical symptoms resemble closely those of encapsulated fluid. As a rule, the disease was local in character, general tuberculosis rarely co-existing and in no wise being affected by the operation upon the abdomen. These conditions have corroborated the views expressed by König that peritoneal tuberculosis is a local affection, which can be relieved by local treatment in the same manner as tuberculosis of the bones and joints. Kümmell concludes that laparotomy is both a curative and palliative measure in tubercular peritonitis. To be effective, the operation should consist in thorough cleansing of the cavity with antiseptic solutions and sponging. Iodoform gauze may be used to wipe over the surfaces. The question as to the manner in which cure is effected in tubercular peritonitis by laparotomy and evacuation of the ascitic fluid, with cleansing of the cavity, is still undecided. As yet no positive demonstration of the process of relief has been made, and until this is done difference of opinion as to the correctness of the views suggested will exist. Experimental research will, undoubtedly, solve the problem. Increasing experience will assist greatly in perfecting methods of diagnosis in cases of tubercular peritonitis, and in this way establish the operation undertaken for its relief upon a scientific basis. In future, greater care will, no doubt, be exercised in the examination of those cases in which any suspicion may be entertained as to the existence of tuberculosis.

Perforative Peritonitis.—The systematic arrangement of the subject of peritonitis defers the discussion of this variety until the conditions which are concerned in its production can be treated of. Numerous contributions have been made in connection with gunshot-wounds and intestinal perforations due to disease.

STOMACH AND INTESTINAL TRACT.

STOMACH.

Gastrostomy.—J. Collins Warren reports a case of gastrostomy for cancer of the œsophagus, ⁵⁹_{Nov. 5, '91} and discusses the difficulties encountered in preventing leakage from the fistula made in the stomach and the measures adopted for overcoming them. The abdomen was opened by an incision two inches in length, a finger-breadth below and parallel to the cartilage of the eighth rib. A portion of the wall of the stomach, about three inches from the pylorus and one and a half inches from the greater curvature, was selected to be sutured to the abdominal wall. With regard to the method of attaching the surface of the stomach to the abdominal incision, Dr. Warren says that the peculiarity of the method consists in attaching a considerable portion of the surface of the stomach to the peritoneal surface of the lips of the wound by an outer row of quilted sutures, so that the peritoneal surfaces shall be brought together for the space of half an inch in breadth around the margins of the incision. Seven such sutures were applied, each suture being passed through the outer walls of the stomach by means of fine sewing-needles. The two ends of each suture were then threaded into glover's needles, which were passed through the abdominal walls, and the knot tied on the surface of the skin. Ten superficial sutures united the edges of the incision to the peritoneal surface of the stomach. The stomach was not opened, but a loose stitch was left to the outer wall as a guide. The anti-septic dressing was held in position by a broad strip of adhesive plaster. On the fourth day the dressings were changed, a pad of cotton saturated with a weak solution of phenyle being substituted for the previous dressing. The sutures were gradually removed, the last on the ninth day, and the stomach being firmly united to the abdominal walls, it was opened by a thrust of a fine tenotome, the incision being made obliquely through the walls. A fine gum-elastic catheter was introduced, but as this caused, by its rigidity, some enlargement of the wound, a soft-rubber catheter was substituted and held in place by a "doughnut" pessary and bandage. A troublesome cough appeared soon after the operation, and the expulsive efforts made caused ejection of the contents of the stomach, which the apparatus, consisting of a belt and rubber bag

perforated to allow the passage of the catheter, could not control. It became evident, therefore, that some valve-like appliance was necessary in order to keep the fistula securely closed during the act of coughing. Experiments were made with flexible rubber material which could be introduced through the fistula in a folded state and then expanded so as to close the opening behind. An apparatus to accomplish the purpose was fashioned by making a flexible rubber button, cut from a piece of rubber ball, which passed over and was firmly secured near the end of a piece of tubing. The tube, with the button attached, was introduced through the fistula, the latter being folded upon itself, and over the projecting end a small doughnut pessary was slipped. Pressure was thus exerted upon the inner and outer margins of the fistula, and leakage quite effectually prevented. At one time a small rubber bag was substituted for the button, which by its pressure had caused ulceration. The button was, however, replaced and used successfully until the patient's death, which occurred four months after the operation from extension of the cancer of the œsophagus and a condition of malassimilation, as indicated by a slow and steady emaciation with loss of strength. The experience of Dr. Warren with the valve-like apparatus used in this case directed his attention to securing, if possible, by a method of operation, a valvular fold of mucous membrane which, hanging over the inner opening of the fistula, would close it, as in the case of Alexis St. Martin, which Dr. Beaumont describes as "a valve formed by a slightly inverted portion of the inner coat of the stomach, fitting exactly to the aperture. Its principal and most external attachment is at the upper and posterior edge of the opening. Its free portion hangs pendulous and fills the aperture when the stomach is full, and plays up and down, simultaneously with the respiratory muscles, when empty." Dr. Warren concludes with the statement that he has "succeeded in making a fistula in the stomach of a dog, so protected by a valve of mucous membrane that the food and liquid swallowed do not escape," and that he is engaged in further experiments in this direction.

M. F. Porter,⁶¹_{July 28} gives an account of a case of organic stricture of the œsophagus in which gastrostomy was successfully performed. He discusses the following questions: 1. When should the operation be made? 2. At what time should the opening in the stomach

be made relative to the opening of the abdomen? 3. What anæsthetic should be used? 4. What kind of tube is best? With regard to the first question he adopts the opinion of J. Greig Smith that the operation is "systematically delayed too long," and "further, that it ought not to be delayed beyond the time when the health begins palpably to suffer."

The importance of decision in the second question depends upon the condition of the patient at the time of operation. If it is good, it is better to delay the gastric incision for four or five days, when union between the stomach and abdominal wound is firm. If bronchitis is present or death from exhaustion is imminent, the operation should be completed in one stage. The presence of bronchitis or pulmonary irritation is regarded as a contra-indication for the administration of ether, and, therefore, chloroform is to be preferred. With regard to the best tube, the author thinks "an ordinary soft-rubber catheter of large size (No. 26 to 30 f.), held in place by adhesive strips, meets all requirements better than any other device." Tubes made of hard material are objectionable on account of the ulceration and absorption produced by the pressure apt to be exerted by them.

Girard¹¹³_{No. 26} describes a method of forming a sphincter after gastrostomy to prevent leakage from the gastric opening. The sphincter is made in the rectus muscle, a wedge-shaped portion of the stomach near the fundus being drawn out through the incision made in this muscle. Parallel to the operation wound an incision is made on either side separating two strands of muscle-fibre about the thickness of a finger. These bands are crossed laterally and the stomach drawn through the sphincter-like opening. The bands and the gastric pouch are fastened in place by sutures, after which the stomach is opened. By this method Girard hoped to obtain a sphincter controlled by muscular contraction or by tension of the rectus muscle on the cicatrix, in the event of the occurrence of atrophy of muscular fibre. The early death of the patient from exhaustion, not due to the operation, prevented any report upon the value of this method in guarding the opening of the gastric fistula.

Pepper, of London, reports⁶_{Nov. 24} three cases of gastrostomy with one fatal result. He advocates early operations, especially in malignant disease of the œsophagus.

At the meeting of the French Society of Surgery, Ter-

rillon,⁹¹_{June 10} presented a patient upon whom he had performed gastrostomy for stricture of the œsophagus. The gastric fistula became enlarged spontaneously, permitting the gastric juice, which contained a large quantity of hydrochloric acid, to escape and digest the margins of the opening. To overcome this condition he had made a cannula, constructed of two pear-shaped rubber buttons united by a sound, which played freely through the passage. This permitted cicatrization of the wound and a retraction of the fistula. Segond stated that he had found a simple ball of cloth the best means of closing the gastric fistula, the adjacent parts of the skin being covered with vaseline. Lucas-Championnière remarked that he never permitted the catheter to remain in the gastric fistula, as its presence facilitated the escape of the gastric juice.

Gastrotomy. — Interesting and valuable observations have been recorded by M. H. Richardson,⁹⁹_{Dec. 16, '88} upon the selection of the operation, between œsophagotomy and gastrotomy, in the impaction of foreign bodies in the œsophagus. He was directed to the study of the subject by his experience in a case under his care in which he performed gastrotomy to accomplish the removal of an artificial denture, carrying four teeth, impacted at the cardiac end of the stomach, two inches above the diaphragm. An oblique incision, six inches in length and parallel to the borders of the ribs on the left side, was made to open the abdomen. The stomach was drawn through the wound and held with both hands of an assistant so as to flatten it. The incision opening the stomach should be made far enough to the right to permit any instrument required to be introduced into the œsophagus to pass along the groove between the anterior and posterior walls. The instrument will enter the cardiac opening easily if it is carried obliquely to this groove and passed upward, and at the same time pressed lightly against the straightened lesser curvature. In the case reported the hand was introduced into the stomach and the finger into the œsophagus, and after careful manipulation the denture was dislodged and removed. After a series of sixty observations upon the cadaver, Dr. Richardson arrived at the general conclusion that when the foreign body is situated more than six inches from the cricoid cartilage, or thirteen inches from the upper incisor teeth, it can be easily reached through the stomach, and that it should be removed by the operation of gastrotomy.

W. T. Bull⁹_{Oct. 22, '87} performed gastrotomy for the purpose of removing a peach-stone which had become impacted in the œsophagus thirteen inches from the upper incisors. The abdomen was opened by vertical incision three inches in length, extending from the level of the ninth costal cartilage to two inches above the umbilicus. A portion of the anterior wall of the stomach, about three inches from the pylorus and midway between the greater and lesser curvatures, was drawn out through the wound, and two loops of silk were passed through it, two inches apart in a vertical line. An incision one and a quarter inches long was made between these loops, and two more loops of silk were passed through the edges of the gastric wound in order to control it thoroughly. The index finger was passed into the stomach directly backward until the vertebral column was reached, then upward to the entrance of the œsophagus. The finger entirely occluded the opening in the stomach, and its anterior wall was invaginated and carried into the cavity. An unsuccessful effort was made to remove the stone with the straight and curved œsophageal forceps. A slender bougie was then passed over the finger and projected from the mouth, to the lower end of which a sponge one-half inch in diameter and one and a half inches long was tied with strong silk, one end of which was left long. The sponge was pulled through, but did not bring the stone with it. A longer sponge was then tied to the long end of the silk, and on being drawn through brought the stone with it. The advantages of the method employed by Dr. Bull are the smallness of the gastric wound and the moderate manipulation of the stomach required, owing to the invagination of the anterior wall accomplished by the finger, which also acts as a plug.

John Berg³⁷¹_{Id 19, No. 25} reports the removal of a hair tumor by gastrotomy from a patient in the Seraphim Hospital in Stockholm. The tumor had been noticed for two years occupying the epigastric and left hypochondriac region. Exploratory laparotomy was performed and the tumor found in the stomach, which was opened by an incision six or eight centimetres long, parallel to the greater curvature. The tumor was removed piecemeal, consisted of long and short hairs forcibly compressed, and weighed about nine hundred grammes. Prompt recovery ensued. The patient denied having chewed and swallowed hair since she was a child. This,

with the cases of Schönborn and Thornton, makes the third case, all successful, of gastrotomy for removal of hair tumor.

Max E. Witte, of Mt. Pleasant, Iowa,⁶¹ places on record a case in which he performed gastrotomy for the removal of a heavily plated, four-pronged, spoon-handled fork, seven and one-half inches long and one inch wide across the prongs. The patient, a female aged thirty-one, was an inmate of the Insane Hospital at Mt. Pleasant, and had swallowed the fork, it is believed, more than three months before the operation, as it was missed at that time. A tumor could be detected about the size of an orange in the region of the stomach, and the patient manifested great suffering. Later a hard, pointed body could be felt connected with the tumor and involving the abdominal walls. The diagnosis of foreign body within the alimentary canal and perforation of the walls was made, and laparotomy decided upon. An incision was made directly over the tumor, opening the abdomen, when the four prongs of a large table-fork were found projecting through the anterior wall of the stomach. The stomach was opened, the fork liberated and removed. The gastric wound was sutured to the edges of the abdominal incision by deep and superficial sutures. This was done as there were adhesions between the stomach and abdominal walls. The wound healed promptly and without a resulting fistula. The patient was soon restored to her usual health.

Pylorectomy.—With regard to this operation, the experience of the past year has in large measure confirmed the views expressed in the paper on the surgery of the abdomen in the last issue of the ANNUAL. The results following the operation have not improved the mortality rate, and efforts have been made to introduce as a substitute for it operations of less severity in those cases in which it can at the best be regarded as a palliative measure only. Even in the most favorable cases of carcinoma of the pylorus, those early recognized and circumscribed in character, without involvement of surrounding structures, recurrence of the disease has been noted in a comparatively short period, and in some of these cases fatal results have followed the operation. In cicatricial stenosis of non-malignant character the method of digital divulsion, as devised by Loreta, has proved successful in a number of cases, and it may be regarded as an operation quite devoid of danger.

F. Salzer,⁸⁴ assistant in the clinic of Professor Billroth, gives

a statement of four operations of resection of the pylorus during the year 1887, three of which were performed by Professor Billroth and one by himself. Of the four operations, one by Billroth resulted fatally in fourteen days. Apparently it was the simplest case, being one of cicatricial stenosis of the pylorus of small extent. The remaining cases were living at the time of the report and had gained materially in weight. In two the diagnosis, prior to operation, was that of carcinoma of the pylorus. Microscopic examination showed the growths to be cicatricial tissue. One was diagnosed as an "abdominal tumor" and was found to be a cystic sarcoma of large size, involving the anterior and posterior wall of the stomach, extending upon the greater curvature to the extent of thirteen centimetres.

Wm. McLennan, Resident Physician of the Western Infirmary, Glasgow,² reports a case of cancer of the pylorus under the care of Professor McCall Anderson, in which pylorotomy was performed by Professor Buchanan. The patient, a woman aged forty-eight, was admitted to the Infirmary, complaining of symptoms referable to the stomach of four months' duration. She was very weak, much emaciated, and after the ingestion of food suffered from vomiting and pain, which was almost continuous, in the epigastric region. Inspection of the abdomen revealed a marked distention in the epigastric and left hypochondriac regions, outlining the distended stomach. The greater curvature was distinctly indicated, extending below as far as the umbilicus and terminating on the right in a hard and nodulated tumor about the size of a hen's egg, which was freely movable in all directions. Under careful dietetic treatment, which consisted largely in the rectal administration of milk and beef peptonoids, the dilatation of the stomach was relieved, the patient felt very much more comfortable and did not seem to be any weaker than at the time of her admission. The symptoms of the case pointed to the existence of cancer of the pylorus, and while the small size of the tumor, with its great mobility, indicated absence of adhesions, involvement of surrounding structures led to the conclusion that it was a suitable case for resection. Operation having been decided upon, the patient was transferred to the service of Professor Buchanan, who performed pylorotomy after the method of Billroth. The abdomen was opened by a vertical incision from the ensiform cartilage

to the umbilicus, and the pylorus, with the tumor surrounding it, was brought easily through the wound. The lesser omentum was separated from the lesser curvature and the greater omentum from the greater curvature, double ligatures being applied and the tissue between them divided. The stomach and duodenum were held between the index finger and thumb of the two hands of an assistant, and the structure beyond the point of disease cut with the scissors, removing the tumor. Silk sutures to the number of forty were now introduced, closing first the upper portion of the stomach wound and then attaching the duodenum to the lower portion. The escape of the contents of stomach and bowel was prevented. At the completion of the operation, which required three hours, the patient was in a state bordering on collapse, almost pulseless, cold, and white. Slight reaction took place, but did not continue, and the patient died about seventeen hours after the operation. The autopsy showed that the operative procedures had been perfectly successful. The tumor on examination proved to be a carcinoma of the colloid variety. At the autopsy a small gland was found in the lesser omentum, which was infiltrated with material somewhat resembling the primary tumor. In commenting upon this case, Professor Buchanan states it as his belief that if the operation is to be undertaken with any prospect of success, it should be done at a very early period, before inanition occurs from starvation, that long exposure of the abdominal cavity conduces to fatal results, and that the freedom of the tumor from complications of adhesions or secondary infiltrations is necessary to a successful issue,—conditions which it is difficult, if not impossible, to determine prior to operation. With regard to the propriety of performing the operation in carcinoma, he quotes the opinion of Butlin and that of Billroth as given by his assistant, Salzer. The former says: "The excessive mortality due to the operation, the rapidity of recurrence in what have appeared to be most favorable cases for operation, the return of the symptoms of obstruction in some, if not in many, of the cases, and the fact that there does not appear to be one case which can be claimed as a genuine cure, lead me to doubt whether the operation of resection of the pylorus for cancer is ever a justifiable operation." Salzer states that Professor Billroth "does not only consider the operation of resection of the pylorus as a justifiable one, but he continues operating with good

results in many cases. Of course, he does not operate in cases of carcinoma if there are already infiltrations and adhesions to the liver and pancreas. In these cases he prefers Wölfler's operation of gastroenterostomy."

In a letter referring to the above quotations, Mr. Butlin² gives the evidence upon which his opinion was based as follows: Of fifty-five cases of resection of the pylorus for carcinoma, forty-one died, thirteen recovered, and in one the result was not ascertained. In ten of the thirteen cases of recovery, recurrence took place within a year's time in most of them, and in some in a few months' time. With a mortality of 70 per cent. and a large percentage of recurrence in the cases recovered, he thought that the doubt expressed by him with regard to the justifiability of the operation for carcinoma could not be deemed unreasonable.

Benedict Streit, an assistant in the clinic at Bern, records three successful resections of the pylorus performed by Kocher.³⁰¹ Of the three cases, two were females, aged forty-two and sixty-three years, and one a male, aged thirty-four years. All suffered from carcinoma of the pylorus. In the first case death occurred three years after operation. No recurrence had taken place in the second during two years. The third died of recurrence and pyloric stenosis six months after the operation. Kocher's method of operation differs somewhat from that of Billroth in the use of large clamps to compress the stomach and intestines before section, invagination and suture with the *etage* stitch of the compressed margins of the wound, and, finally, the employment of the continuous sutures, in sections, in uniting the stomach and intestines. The abdomen is opened by incision in the linea alba. He prefers sterilized-silk sutures.

Digital Divulsion in Stenosis of the Pylorus.—Allusion has been made above to the good results obtained in fibrous stricture of the pylorus by the operation of digital divulsion as devised and first practiced by Loreta, of Bologna, in 1882.

Bufalini⁵⁸⁹ reports a case of fibrous stricture in which Loreta performed dilatation with the happiest results. The stomach was first washed out with an alkaline solution, the abdomen opened by an incision from the ensiform cartilage to the umbilicus, and the stomach incised about midway between the greater and lesser curvatures. The pyloric orifice was so contracted that it would not admit

the finger, and a large-sized urethral bougie, and afterward an œsophageal sound, were passed through and sufficient dilatation made to permit the right index finger to be inserted. The left index finger was then passed through on the right, and forcible divulsion was effected by the two fingers with some difficulty, owing to the tightness of the stricture. The wound in the stomach was closed by continuous and that of the abdomen by interrupted sutures, and an antiseptic dressing applied. Recovery took place promptly, the patient being completely relieved of his sufferings. Bufalini states that not a single instance of relapse after Loreta's operation has yet been reported. There can be no question as to the value of this operation over the severe one of pylorotomy in fibrous stenosis.

Gastroenterostomy. — The experience of the past year has confirmed the opinion of surgeons with regard to the position assigned to this operation, and established its value as a substitute for pylorotomy in those cases where radical cure is not possible. It is indicated in all cases of glandular infiltration and where there are extensive adhesions to adjacent organs. It possesses many advantages, among them that it restores the normal avenues of nutrition.

Fritsche²¹⁴_{No. 15; May 6} reports two successful cases of this operation, the method of Wölfler, the originator of the operation, being employed.

Lauenstein³³⁶_{No. 26} places on record a very interesting case in which gastroenterostomy was performed, the fatal termination being due to the physiological exclusion of the greater part of the small intestine, a loop of the ileum, within sixteen inches from the ileo-cæcal valve, having been taken in mistake for the jejunum and opened and sutured to the stomach. Meat appeared per rectum practically unchanged one-half hour after it had been taken into the stomach. There was evidently an entire absence of digestion or absorption, and eleven days after the operation the patient died from inanition. At the post-mortem examination it was found that the opening in the small intestine was about sixteen inches from the ileo-cæcal valve, and, so far as the opening between the stomach and intestine was concerned, the operation had been a complete success. The portion of the intestine which was excluded was empty and contracted. The lesson to be learned

from the result in this case is that great care should be exercised in searching for the jejunum, which should be found, although it may require a larger abdominal wound and longer time in the performance of the operation.

Lange,¹ reports a case of carcinoma of the pylorus in which he performed gastroenterostomy, the patient dying on the thirty-first day after the operation as the result of perforation of the posterior wall of the stomach at the site of the carcinomatous ulcer. It was not ascertained at the autopsy what part of the intestine had been attached to the stomach. At the time of the operation search for the jejunum was abandoned, and a loop of intestine taken which corresponded approximately to that region. Nothnagel's test, which consists in the application of chloride of sodium to the surface of the intestine in order to ascertain the direction of peristalsis, was employed without result. The patient suffered from stercoraceous vomiting at times. This ceased three or four days before death.

Duodenostomy—Jejunostomy.—Of these two operations, the latter has been performed twice in 1887 by Maydl, of Vienna.¹ The first patient survived seven weeks, during the first five of which the nutrition was satisfactory, but flesh was lost rapidly during the last two. The second patient died nine days after the operation with all the signs of insufficient nourishment. At the autopsy this was accounted for by the discovery that the opening had been made about midway between the duodenum and cæcum, lower down than was intended. In both patients the carcinomatous disease of the stomach was so extensive as to forbid a resort to either pylorotomy or gastroenterostomy. The results in both cases show that the operation in itself is free from danger of death by shock or peritonitis. With regard to the question of nutrition, the difficulties which present themselves on physiological grounds, relating to the gastric and pancreatic ferments, can be readily met by preliminary artificial digestion or by the introduction of these ferments with the food. Those which relate to the bile are not so easily disposed of, if this agent is, as is commonly believed, an important aid in digestion and absorption. The operation is performed by making a transverse incision three or four inches in length to the left of the umbilicus, dividing the rectus and adjacent muscles. The upper end of the jejunum is sought for by

passing the finger along the lower surface of the mesocolon to the back of the cavity. A point about a foot below the duodenum is selected and fastened to the abdominal opening by twelve or fifteen interrupted silk sutures, the needle being carried through the muscular coat of the intestine and the parietal peritoneum and fascia, so as to include an area on the surface of the intestine about half an inch in diameter. The rest of the wound of the abdomen is closed without the introduction of a drainage tube. A silk suture should be stitched at each end of the exposed area so as to facilitate its perforation, which should be done after the lapse of a few days or a week with a small Paquelin point, the opening being not larger than a medium-sized catheter. If, in the future, it is found that the nourishment by the intestinal fistula is sufficient, the operation of jejunostomy will take the place of the more formidable operations of pylorotomy and gastroenterostomy. Under antiseptic methods it can be performed with little hazard, and by surgeons of comparatively small experience in the surgery of the abdomen.

Shot- and Stab-Wounds of the Stomach and Intestines.—W. B. Coley⁹⁹_{Oct. 18} publishes a series of interesting tables containing the records of seventy-four cases of penetrating shot-wounds of the abdomen. He divides the cases into three classes with regard to the time in which operations were performed. The first class, in which are placed those operated on within the first twelve hours, contains thirty-nine cases, with a percentage of recoveries of 43.6. The second class, including those operated on after twelve hours, contains twenty-two cases, with a percentage of recoveries of 22.7. The third class, embracing those in which the time of operation could not be discovered, contains thirteen cases, with a percentage of recoveries of 57. The record thus presented, the author thinks, confirms the views entertained by American surgeons with regard to the value of early operation.

Shot-Wound of Stomach and Liver.—H. C. Dalton read at the meeting of the Missouri State Medical Association, April 17th, ⁸²_{v. 1, p. 486} an account of a case of gunshot-wound of stomach and liver in a colored man, aged twenty-two, in which he opened the abdomen and sutured the wounds of the stomach and liver with a successful result. The abdomen was opened by an incision from the ensiform cartilage to the umbilicus in the median line, the

wound of entrance made by the ball being about five inches to the left of the median line and two inches above the umbilicus. The wounds of the stomach were found, that of entrance on the anterior surface about three inches directly below the cardia, and that of exit near the border of the lesser curvature about an inch and a half from the pylorus. The wound in the liver was in the lower border of the left lobe, an inch and a quarter from the longitudinal fissure, extending in a V-shaped manner to a half-inch in depth. There was a slight contusion on the upper surface of the transverse colon near the hepatic flexure. The wounds of the stomach were closed by Lembert sutures, the finest iron-dyed silk being used, introduced by the smallest quarter-curved oculist's needle. One catgut suture of large size was employed to close the wound of the liver, introduced an inch from the edge of the wound and an inch in depth. The visceral wounds were dusted with iodoform and the abdominal incision closed with interrupted silk sutures. The wound made by the bullet through the abdominal wall was washed with bichloride solution, dusted with iodoform, and closed by continuous catgut sutures. The bullet was not found. The patient was discharged well in six weeks. The author appends the table of cases of penetrating wounds of the abdomen prepared by Sir William MacCormac, with the exception of two cases, and adds others, making sixty-nine cases, with twenty-seven recoveries and forty-one deaths, with one in which the result was not given.

J. M. Barton¹⁹_{May 12} reported at the meeting of the Philadelphia County Medical Society a case of two penetrating stab-wounds of the abdomen in the one person, involving the transverse colon and liver, treated successfully by laparotomy and suture of the wound in the colon, the liver-wound being so small as not to require suture. The wounds in the abdominal wall were both at the outer edge of the right rectus muscle, running obliquely toward the median line and penetrating the peritoneum at that point. The abdomen was opened by incision from ensiform cartilage to the umbilicus, and a continuous silk Lembert suture was used to close the wound in the colon. The patient was discharged cured in twenty days.

The successful results obtained in cases above reported corroborate the views expressed in the ANNUAL of last year with

regard to the great importance of performing laparotomy promptly, seeking for the wounds in the viscera, applying sutures, and washing out the abdominal cavity with hot water and antiseptic solution. In doubtful cases of visceral perforation, Senn's method of the insufflation of hydrogen gas per rectum can be resorted to. The ease with which the abdominal organs can be examined when the cavity is opened by the median incision commends this method as possessing decided advantages over that of enlarging the wound made in the abdominal wall.

Resection of the Intestine—Enterectomy.—A large number of interesting cases of intestinal resections have been reported in the current medical literature of the past year. Hofmohl⁶⁹_{Apr. 5} exhibited at the meeting of the Society of Physicians in Vienna a woman, aged twenty-nine, upon whom he had performed resection of the intestine for adeno-sarcoma, removing a part of the ascending colon, cæcum and vermiform appendix. The intestine was immediately united by a threefold series of silk sutures and the abdomen closed. Drainage was not employed. The patient made a prompt recovery.

Thomas Sinclair,²_{June 2} reports a case of jejunal enterectomy for the closure of an artificial anus of eighteen months' standing, with recovery, in a man sixty years old. The artificial anus was the result of the sloughing of a femoral hernia of the right side which had failed to close under the treatment adopted. A considerable quantity of chyme escaped from the opening, showing that it was high up in the intestine, and as a result of this condition emaciation developed rapidly. The very dense cicatricial tissue about the opening, the absence of a well-formed spur, and the large area of the intestinal wall involved, precluded resort to a plastic operation, the employment of Dupuytren's enterotome, or the operation of enterorrhaphy. Enterectomy alone remained. Rest in bed for a week, with a castor-oil purgation on every third day and an enema the evening before and the morning of the operation, constituted the preparatory treatment. An incision was made in such a manner as to liberate the bowel, which was then drawn out through the opening. The intestine was clamped above and below with pieces of drainage tube held by hæmostatic forceps, and the section was made obliquely to the long axis, removing in this manner with the scissors three inches from its concavity and

four and a half from the convexity. Ten ligatures were required to control the hæmorrhage following the section of the intestine. The mesentery was now divided close to the intestine and ten vessels tied. None of the mesentery was removed, the cut edges being sutured together. Two dozen fine carbolized silk Lembert sutures, introduced with a fine cambric needle, two lines apart, were employed to unite the divided ends of the intestine. None of the sutures were tied until all had been passed. The folded and redundant edges of the mesentery were sutured so as to support the intestinal sutures at this important point. The abdominal cavity was washed out with warm boric acid solution, a drainage tube placed superficially in the wound, not extending into the abdominal cavity, the wound closed and dressed with iodoform, salicylic wool, and an elastic roller. The operation occupied two hours and the administration of ether was conducted in such a manner as to require the use of but *one ounce*. (?) The after-treatment, owing to the fact that the enterectomy involved a portion of the jejunum, was conducted with great care, so far as alimentation and the use of opiates were concerned. For ten days food was given entirely by the rectum, consisting of pancreatized milk, pancreatized beef-tea, and predigested beef suppositories. After that date food was given carefully by the mouth. The dressings were removed on the sixth day for the first time, the sutures and drainage tube being removed at the same time. On the tenth day a natural movement of the bowels occurred. The patient was discharged cured on the twenty-eighth day. In commenting upon the case, Sinclair refers to the statement of Barker that six days suffice for firm union between the ends of the intestine, and that after that period no fear may be felt as to alimentation, in proper manner, by the mouth. He also quotes the remarks of Greig Smith, that "under the best form of rectal alimentation yet devised the patient steadily loses ground."

J. M. Barton¹⁹_{May 12} reported at the meeting of the Philadelphia County Medical Society a case of epithelioma of the ileo-cæcal valve in which three inches of the intestine, including the valve, were resected. An artificial anus was formed and the relief of it attempted at once by the application of Dupuytren's enterotome. This failed, the clamp having been applied three times at intervals, the fæces passing for a few times naturally and then escaping by

the artificial anus. The method of Banks, of Liverpool, which consists in the introduction of a piece of heavy rubber gas-tubing about six inches in length into the ends of the resected bowel, a strong ligature having been attached to it, was also tried without success. A modification of this plan was then adopted and proved successful. This consisted in joining two pieces of heavy rubber gas-tubing securely by wire in the shape of the letter T. The upper portion of the T is about one and a half inches and the vertical portion three inches in length. The former pressed directly against the spur, while the latter served to keep it in position. A large proportion of the fæces began to pass at once by the natural outlet and continued to do so. When this method had been sufficiently tested it was proposed to close the artificial anus. The patient upon whom this operation was performed is the one upon whom Dr. Barton performed digital and instrumental dilatation of the intestine at the site of the subsequently developed epithelioma for which resection was now done. The case was reported in the ANNUAL of 1888. The question of immediate suture or the formation of an artificial anus in bowel resection is difficult to decide, especially where the ascending colon or ileum is involved. The statistics of Hahn⁹⁹_{Apr. 6} seem to prove that in resections of the colon the formation of an artificial anus gives the most favorable results. Of these cases in eighteen the intestine was sutured with ten deaths, a mortality of 55.5 per cent. In eight cases of artificial anus three deaths occurred, a mortality of 37.5 per cent. Hahn states that although these results favor the formation of an artificial anus, still, one must, before deciding in favor of this operation, learn the mortality from the secondary operation for closing the artificial anus. He reports two cases of successful removal of part of the colon and ileum for sarcoma. In one he removed about one metre of the colon, cæcum, and ileum. In both an artificial anus was formed. Hahn records the cases of resections in which one metre (three and a quarter feet) or more has been removed, viz.: those of Baum, 1.37 metres removed; Köberle, two metres; Kocher, 1.60 metres—all removed from small intestine with immediate suture. In Baum's case death occurred at the end of four months from marasmus caused by malnutrition. It would seem that a loss of a large extent of small intestine is better borne than an equal amount of ileum and colon.

ACUTE INTESTINAL OBSTRUCTION.

In a review¹ of the paper of B. F. Curtis on "Enterostomy," which he defines as the operation of forming an artificial anus in any portion of the intestinal canal, including both colotomy and enterotomy in the treatment of acute intestinal obstruction, the statistics of a series of sixty-two such operations are given, in forty-six, or 72 per cent., of which relief was given. In six relief was not afforded. Of these six the fistula was established below the point of obstruction. In ten the result was either fatal or not recorded. Thirty died, making the mortality 48.3. In nineteen cases, or 60 per cent., of those in which recovery took place, normal passages per anum were resumed after an interval of time varying from twenty-four hours to ten weeks. The last fifteen cases give: Relieved, fourteen; unrelieved, one; died, four; recovered, eleven. Of these eleven successful cases defecation per anum was resumed in seven. In seven cases the fistula closed spontaneously. The causes of death were, in sixteen cases, sepsis, failure to reach the distended bowel, subsequent gangrene of the bowel, and shock. The histories of the cases show that intussusception, volvulus, constriction by bands or adhesions, impaction of foreign bodies, and even internal incarceration can be rendered harmless by relieving the pressure from behind by opening the distended intestine at a point *above* the seat of obstruction. The study of three hundred and twenty-eight cases of laparotomy for acute intestinal obstruction gives the following results: The mortality of laparotomy for this condition is 68.9 per cent. against the 48.7 per cent. of enterostomy. Of three hundred and twenty-eight cases treated by laparotomy, 5.8 per cent. were fatal because of failure to remove the cause of obstruction. While 4.8 per cent. of sixty-two cases of enterostomy restored the power of normal defecation in 60 per cent. of the cases, laparotomy achieved this result in but 79 per cent. of the cases in which recovery resulted. Laparotomy is to be preferred in those cases only in which the patient is able to bear the shock of the operation and those in which slight distention of the intestine permits thorough examination of the contents of the abdomen. Enterostomy should be performed in all other cases and may be followed by laparotomy should it prove inefficient, for the purpose of removing the cause of obstruction and of closing the artificial anus. Whichever of

the two operations is selected, it should be performed at as early a period in the course of the affection as possible. It is doubtful whether the general practice of establishing an artificial anus, with all the disgusting and discomfoting conditions attending it, will meet with the approval of the profession generally.

Curtis²³⁴_{Sept.} gives the views of prominent surgeons upon this subject. With regard to diagnosis nothing new is added to the knowledge now possessed. The importance of early operation is strongly urged by all, the general opinion being that the mortality in laparotomy for acute intestinal obstruction has been greatly increased by the delay which has attended these cases, the surgeon being called in at a time when the vital powers of the patient are so low as to render him unable to withstand the shock of operation. Weir recommends chloroform as the most suitable anæsthetic for these cases. Ether he believes produces more shock, and the bronchial irritation is very injurious. He also advocates a long incision in performing laparotomy for intestinal obstruction. It assists greatly in making the operation brief—a very desirable point to be attained. Puncture of the intestine is condemned, owing to the danger that the openings may not close on account of the paralysis of the wall of the bowel. R. H. Fitz,⁹⁹_{Nov. 16, 22, 23} in an able paper, analyzes the symptoms of strangulation, intussusception, volvulus, impacted gall-stone, stricture by bands, and tumor, and concludes that the symptoms, apart from stoppage of the bowels, upon the presence of which the physician must rely to establish a diagnosis of acute intestinal obstruction, are pain, nausea or vomiting, abdominal tympany, and abdominal tumor. Fever, hiccough, jaundice, and abnormal conditions of the urine are all occasional and subordinate. The various external hernia and peritonitis are to be excluded as the cardinal symptoms of the mechanical intestinal obstruction. Pain, vomiting, tympany, and tumor are present in these conditions. In more than four-fifths of the cases, when the urgent symptoms of acute obstruction are present, the source is found in the lower portion of the abdomen. The physician is called upon to remember “that nearly all cases of acute mechanical intestinal obstruction die unless relieved by surgical interference; that curative medical treatment has proven of positive service in only a limited number of cases of intussusception, possibly in a few of volvulus in the large intestine and in certain cases of gall-

stone in the small intestine; that his first duty, after relieving pain, is to determine the capacity of the large intestine; that this is best accomplished during the *first two days* following the *initial pain*, before tympany makes the task more difficult and pathological changes cause it to be more dangerous; finally, that the means employed for this purpose represent the most efficient curative agent in his control." Rectal injection and replacement with a repositor, combined with anæsthesia, massage of the tumor, and inversion of the body, constitute the mechanical treatment which may be employed. "In the light of the published experience of the past eight years, the medical treatment of acute obstruction is limited to the use of injections during the *first three days*, under sufficient degrees of pressure, within fixed limits, to determine the patency of the large intestine. If it prove impossible the case is no longer medical but surgical. In conclusion, acute intestinal obstruction is diagnosticated¹ by exclusion. Its seat is fixed by injection. Its variety is determined by its seat, the age, antecedents, and symptoms of the patient. Its treatment is surgical, on or after the third day, if the symptoms are urgent and forced injections fail to relieve."

A very large number of cases of acute intestinal obstruction in which laparotomy has been performed have been recorded during the past year. A passing review of them seems to show that the mortality rate is slowly improving. The universal opinion is to the effect that the high death-rate is due largely to the delay which occurs in putting the patient in charge of the surgeon. As a result of this delay, the patient comes into his hands at a period when the lapse of time, as well as the severity of the symptoms, have caused a profound failure of his strength. Laparotomy seems to have been regarded as the *dernier ressort*, and the rule, in every case, as stated by Curtis, seems to have been to wait until there was little or no chance of recovery.

Curtis⁹⁶_{May} records three hundred and twenty-eight cases of acute intestinal obstruction treated by laparotomy, with one hundred and two recoveries and two hundred and twenty-six deaths, a mortality of 68.9. He concludes his paper with the statement "that the analysis of the cases shows a very high rate of mortality for laparotomy in these cases, but that this high rate of mortality is due chiefly to the bad condition of the patient at the time, the opera-

tion having been too long delayed, and that it will not be difficult in the future to reduce the mortality by avoiding this error and by making the operation as brief as possible."

Perforation of the Vermiform Appendix—Perforating Appendicitis.—In a paper read before the American Medical Association, Joseph Ransohoff⁶¹_{July 14} discusses in a very able manner the anatomy, physiology, and pathology of the cæcum and appendix. He begins with the declaration that the topography of the cæcum, the vermiform appendix, and the ileum is greatly misapprehended, not only by the profession as a body, but by most anatomical writers. He agrees with Treves in his statement that the cæcum is, with rare exceptions, completely surrounded by peritoneum from the ileo-cæcal valve to its apex. Hence inflammations and perforations of the cæcum without the involvement of the peritoneum are physical impossibilities in the vast majority of cases. The normal appendix is always found completely surrounded by peritoneum and having a distinct mesentery by which it is attached to the under layer of the mesentery of the ileum. In the foetus the mesentery extends to the tip of the appendix, while in the adult the distal half-inch or more is free from mesenteric attachment and therefore movable. This complete investment of the appendix by peritoneum necessarily involves the latter in every perforation of the former. The anatomical relations, he states, of the cæcum and appendix alone suffice to explain certain clinical differences between inflammatory conditions of the one or other part. The cæcum being comparatively superficial in position, its peritoneal coat continuous with that of the iliac fossa and anterior abdominal wall, an abscess about it would speedily manifest itself by the presence of a tumor. The appendix, on the other hand, being deeply seated behind the cæcum and below the mesentery of the ileum, abscesses about it may continue for a considerable length of time without the appearance of a tumor in the right iliac fossa. The fixed position of the ileo-cæcal junction and the mesentery would often direct the progress of such an abscess toward the pelvis. Hence the great importance of rectal exploration, as a diagnostic measure, in cases of suspected inflammation of the appendix. The author directs attention to another clinical feature of not a few cases of appendicitis, the occurrence of marked symptoms of intestinal obstruction. This may occur from pressure by

the thickened appendix upon the ileum from below and behind. Twelve cases have been collected in which perforated appendicitis produced all the manifestations of internal strangulation. With regard to the differentiation of the lesions of the cæcum from those of the appendix and the determination of their proper nomenclature, he says there are most excellent reasons, anatomical and clinical, for separating inflammations here present into those of the cæcum and those of the appendix, each to be subdivided into those of the part itself and those of the peritoneal investment. There is, it appears, a rational basis for the use of the terms, typhlitis to indicate inflammation of the cæcum, perityphlitis to indicate a like condition of its serous coat. Appendicitis should be reserved for inflammation of the appendix and periappendicitis or appendicular peritonitis for that of its peritoneum. The author admits the more frequent occurrence of appendicitis than inflammation of the cæcum proper. While it is certain that typhlitis is far from uncommon, mortuary records fail to show it. The perforations which occur in the cæcum are not often produced by foreign bodies. They are not infrequently caused by tuberculosis, although, as in the case of foreign bodies, the appendix is preferably the part affected. With regard to the occurrence of general peritonitis, the author believes that the favorable position of the appendix for forming adhesions and localizing abscesses often prevents it. The rupture of such adhesions or residuary abscesses may fatally infect the peritoneum. In cases in which the distal end of the appendix is gangrenous and no foreign body is found, the author thinks that this condition is brought about by the displacement of the appendix and consequent torsion of its vessels. He believes, in conclusion, that the inflammatory process in perforative appendicitis tends toward self-limitation and toward the surface, and asks whether it is not possible that, except in *foudroyante* cases, the danger of general peritonitis is somewhat overestimated.

Wm. T. Bull¹¹⁷²_{v.3} read at the meeting of the American Surgical Association an elaborate paper on the "Surgical Management of Typhlitis and Perityphlitis," in which he recorded the results in seventeen cases in which incision or laparotomy had been performed. For the purpose of a brief summary of the results of treatment, the author separated the cases into three groups: The first consisted of ten cases, in which the abscess was opened by incision through

its walls, without opening the general peritoneal cavity. These operations were done at periods varying from seven days to six weeks from the beginning of the attack. All of the patients recovered. They represent the cases which surgeons have usually dealt with successfully since Parker, in 1867, demonstrated the advantage of the extraperitoneal incision before fluctuation. The second group comprised six cases in which the peritoneal cavity was opened seven times for supposed perforation of the appendix with developing peritonitis. The earliest operation was done thirty-six hours after the first symptoms, the latest on the fifth day. Death ensued in two. These are the cases which we are gradually learning to treat promptly and efficiently, but instances of failure are still frequent. A single case represents the third group, in which threatening symptoms made their appearance on the twelfth day of a perityphlitis. The abdomen was opened, no pus was found, nor were there evidences of recent peritonitis, but the appendix was buried in a mass of old peritoneal exudation. Two deaths occurred in the seventeen operations. The author chooses to preserve the use of the term perityphlitis in about the same general manner in which it has been often employed to indicate an inflammation of the cæcum or appendix, together with their peritoneal investment or the cellular tissue of the iliac fossa, rather than to limit it to its more correct application, the inflammation of the peritoneum investing the cæcum. There are good reasons for this from a clinical point of view, for, while we may distinguish by dissection between an inflammation of the cæcum or its appendix, we are, the author thinks, not yet in a position to do so clinically. Most recent writers agree that ulceration leading to perforation is by far most frequent in the appendix, but admit the frequent occurrence of catarrhal inflammation in the cæcum, in which the appendix participates. The term typhlitis alone, or appendicitis, does not express the entire pathological condition. Either may be the starting point, but the invasion of the peritoneum or the cellular tissue is the more significant lesion at the early stage when we are capable of appreciating it. The author concludes with the following propositions:

1. Our present knowledge justifies the statement that both cæcum and appendix may be the starting point of an inflammation, which, spreading to the peritoneum or to the peritoneum and cellular

tissue of the iliac fossa, constitutes a complicated disease, which, for convenience sake, we call "perityphlitis." This may be in its clinical course resolving or suppurative, each marked by definite symptoms in some cases, in others difficult to distinguish. 2. Needle exploration is a justifiable and desirable method of diagnosis, though attended with some risks. These may be reduced to a minimum if care be taken to reserve the practice for cases in which the symptoms have lasted several days, and in which a distinct induration tumor can be made out. 3. Suppurative perityphlitis may be a spreading or a limited (circumscribed) peritonitis. Both begin with the same set of symptoms, and it is important to discriminate in the first twenty-four or forty-eight hours, or even on the third day, between them. The presence of any of the local or constitutional signs of general peritonitis justifies the diagnosis of a spreading inflammation, and calls for the performance of laparotomy. The absence of the symptoms or their strict localization warrants a delay of varying length. Any time after a week the abscess may be opened by an incision, which must reach the pus, whether it be extra- or intra- peritoneal. 4. In doubtful cases the risk of exploration is less than the risk of the disease. 5. The propriety of exploring or removing the appendix in recurrent cases must still remain *sub judice*.

L. S. McMurtry⁶¹_{July}, read in the Section on Surgery at the thirty-ninth annual meeting of the American Medical Association a paper on a case of typhlitis with double perforation of cæcum and peritonitis in which laparotomy and suture of the intestine was followed by recovery. The patient, a young physician, had for some months suffered from occasional attacks of colic, accompanied by nausea and vomiting. When first seen by Dr. McMurtry he was suffering intensely with pain referred to the right iliac region, which was thought to be due to renal colic, especially as the patient had intense reflex pain in the head of the penis. Thirteen days later a slight almond-shaped induration was detected in the iliac region. This induration gradually increased in size until it became an oblong, sausage-shaped tumor, and hæmorrhage from the bowels occurred, the patient losing thirty-two ounces of blood. Following this hæmorrhage, symptoms of perforated peritonitis appeared and laparotomy was performed, the incision, three and a half inches, being made directly over the tumor, beginning two inches to the

right of the umbilicus and continued obliquely in the direction of the pubes. The parietal peritoneum and that covering the caput coli and adjacent coils of small intestine were thickened, highly injected, and exhibited flakes of recent lymph. The vermiform appendix was normal. The peritonitis was limited, but bore evidence of being recent, severe, and spreading. Upon the anterior and external surface of the cæcum were two gangrenous perforations, well defined and circular in shape, one measuring one inch and the other three-quarters of an inch in diameter. One was complete, and permitted free escape of the contents of the bowel; the other was scarcely complete but became so by pressure with the finger, the tissues being greatly softened. The edges of the ulcers were trimmed with the scissors and sutured, the large with five Lembert silk sutures, and the smaller with three. The cavity and parts involved were cleansed carefully in the one to forty hot carbolic solution, a large rubber drainage tube placed deep in the iliac fossa, the abdominal incision closed with silk sutures, dusted with iodoform, and dressed with antiseptic gauze. Immediate improvement followed the operation. On the third day gastric distention occurred, which was promptly relieved by a saline cathartic (seidlitz powder). The patient made a rapid recovery.

C. G. Jennings,²³⁴ at the meeting of the Detroit Medical and Literary Association, reported a case of perforating appendicitis in a pregnant woman, in which laparotomy was performed, followed by premature labor and death. On the third day following the operation labor occurred, and was rendered extremely difficult on account of the impossibility of abdominal manipulation. Collapse followed labor, the patient remained almost pulseless and died the next day.

J. W. Elliot,²³⁵ reported to the Surgical Section of the Suffolk District Medical Society a case of perforation of the vermiform appendix, causing an intraperitoneal abscess and general adhesive peritonitis in which recovery followed laparotomy and drainage. The following propositions were formulated for discussion, in which Drs. Cheever, Homans, Gay, Fitz, and Cabot took part: 1. For cases of chronic or subacute perityphlitis with a small tumor or without tumor, expectant treatment. 2. For cases of chronic or subacute perityphlitis with a large increasing tumor, extraperitoneal incision. 3. For cases of acute perityphlitis with threatening

symptoms and with tumor, extraperitoneal incision. 4. For cases of rapidly acute perityphlitis with alarming symptoms and without appreciable tumor, exploratory incision (extra- or intra-peritoneal).

A large number of cases of perforating appendicitis have been reported in the current medical literature, in many of which recovery has followed laparotomy. The question as to the exact seat of the lesion in the forms which are described is still under discussion.

Perforating Typhoid Ulcer.—Notwithstanding the importance of this question, the cases of perforating typhoid ulcer reported in the ANNUAL of 1888 comprise all thus far reported, no additions having been made during the past year.

At the meeting of the American Surgical Association held in September, J. Ewing Mears¹¹⁷² read a paper on the "Propriety of Surgical Interference in Perforating Typhoid Ulcer," in which he discussed the results obtained in the cases reported and formulated the following propositions: 1. Surgical interference is not justifiable and should not be instituted in cases of typhoid fever in which perforation occurs when the infective process is at its height. This conclusion is based upon our knowledge of the morbid conditions peculiar to and present in the disease and the effects produced by them upon the general system. 2. In mild cases of the disease in which the pyrexia has not been of high grade and in which perforation occurs at the end of the third week or later, when the stage of convalescence is fully pronounced, laparotomy may be performed. Surgical interference in cases of this character is advocated with the hope that if the method of operation suggested by Lücke—laparotomy with the creation of an artificial anus—be adhered to, success may be accomplished. 3. Rapidity in operation will be an essential factor in the achievement of success, prolonged exposure of the cavity being avoided and shock greatly lessened. Median incision having been made, the hand should be passed to the position of the ileo-cæcal junction, the ileum seized, drawn into the wound, and examined as it is slipped through the hand, which should remain in the cavity. The perforation having been found, the portion of the intestine including it should be quickly sutured to the edges of the abdominal incision, the sutures being introduced at sufficient distance from the ulcer edges to insure inclusion of healthy tissues. Hot antiseptic solu-

tions should be then poured in sufficient quantity into the cavity, a glass drainage tube carried to the floor of the pelvic cavity, and the wound closed. Prolonged "toilette" of the peritoneal cavity, as it is generally understood, should not be made while the cavity is open. Irrigations through the drainage tube should be made as soon as the cavity is closed and repeated at such intervals as the surgeon may deem proper. So extremely rare is the occurrence of double or multiple perforation that, after the discovery of one opening, further search of a critical and prolonged character may be safely omitted. As, in the case in which operation is deemed advisable, the perforation is not due to the extension *per se* of the ulcerative action, but to what may almost always be designated as a mechanical cause, the absolute quiet of the patient, which must be enforced, as well as the rest secured to the intestine by the operation for production of an artificial anus, whereby the free escape of the feculent contents and gas is facilitated, will contribute largely to the prevention of further perforations. Should the patient survive, relief from the artificial anus can be obtained by operation.

Colotomy.—Interesting papers upon the technique of colotomy by Knie, of Moscow, Maydl, of Vienna, and C. Lauenstein, of Hamburg, ³³⁶ May 5, June 16 have been published. Knie's method, which had been practiced by him upon dogs only, consists in opening the abdomen by a transverse incision in the region of the transverse colon, suturing the peritoneum to the wound in the abdominal wall, drawing out the colon, and perforating the mesocolon with a blunt instrument, and finally closing the abdominal incision by three or four sutures, which are carried through the opening in the mesocolon. The loop of colon, which is now entirely outside of the abdomen, is then carefully sutured to the edge of the two abdominal openings which now exist. The intestine may be immediately opened, cut away, or allowed to remain, as may be demanded in each case. Maydl and Lauenstein show that they had performed operations the same in principle, and the latter calls attention to the fact that his operations were founded upon experiments of Pamnu ³³⁶ No. 2, 78 on the behavior of loops of intestine fastened outside of the abdominal cavity. Maydl's method consists in opening the abdominal cavity by Littre's incision, two to three inches in length, parallel to and a little above the line of Poupart's ligament, and midway between the anterior superior spinous process

of the ileum and the spine of the pubis. Through the wound thus made a loop of the intestine is drawn until its mesenteric attachment lies in the abdominal wound. A hard-rubber cylinder, covered with iodoform gauze, is passed through an opening made in the mesentery close to the bowel, which supports and prevents retraction of the flexure. Two rows of sutures, including the serous and muscular coats, are employed to fasten the two limbs of the flexure in the abdominal wound passing beneath the hard-rubber support. If the bowel is to be opened immediately it is sutured to the parietal peritoneum of the abdominal wound, and the latter protected by iodoform gauze. If the opening into the bowel is to be delayed, the bowel is not sutured to the parietal peritoneum, but surrounded by iodoform gauze packed under the rubber support. The further treatment of the loop of intestine depends upon the character of the artificial anus to be formed. If it is to be permanent a transverse opening is made with the thermocautery, including one-third of the circumference of the bowel, drainage tubes are inserted into the opening, and the intestine carefully washed out. In two or three weeks the remaining portion of the bowel is cut through and the divided ends are sutured to the integument.

If strict attention has been given to the direction of the muscular fibres of the bowel in making the opening, a good sphincter will result—so efficient that a large drainage tube is required to keep the opening patulous. In making a temporary artificial anus a longitudinal opening should be made; and when it is desirable to change this opening the rubber support is removed, the bowel is retracted by the mesentery, and the opening closes spontaneously. If owing to strong cicatricial adhesions this does not occur, the bowel must be liberated by the knife, sutured, and returned to the abdominal cavity.

Lauenstein's method differs from Maydl's with regard to the manner of supporting the loop of intestine. He does not make an opening in the mesentery, but closes the abdominal wound by passing the sutures through the mesocolon or mesentery, as the case may be, and also secures the limbs of the prolapsed loop by sutures to the parietal peritoneum through its entire circumference, having first attached the skin and peritoneum of the abdominal incision.

LIVER AND GALL-BLADDER.

Extraperitoneal Hepatotomy.—A report of two cases of hepatic surgery is given by L. McLane Tiffany,⁵ in which he excluded from the general peritoneal cavity the area of the liver operated upon by suturing the cut edge of the parietal peritoneum to the surface of the liver with fine and close continuous sutures. The first case was that of a man suffering from an abscess of the liver near the upper surface of the right lobe. An aspirating needle introduced in the axilla at the level of the nipple detected the presence of pus, and an incision was made through the abdominal wall, parallel with and just below the costal arch. The cut edge of the parietal peritoneum was freed to a slight extent and then sutured to the liver surface with a fine and continuous suture, exposing a surface of the liver one inch by two inches, excluded from the general peritoneal cavity. A large trocar and cannula was passed through the substance of the liver for a distance of three inches before the abscess-cavity was reached. A free incision into the abscess was made and a drainage tube introduced. The patient made a good recovery. In the second case laparotomy was performed for the removal of gall-stones. Owing to the inability to expose the gall-bladder by reason of the dense adhesions which surrounded it, the parietal peritoneum was closely sutured to the surface of the liver immediately above it, an incision made through the liver into the gall-bladder, and the gall-stones, fifteen in number, removed. In making the incision in the liver substance a gush of blood followed. The finger was thrust into the opening, which completely filled it, and hæmorrhage was controlled by the pressure which was thus made for the space of three minutes. Recovery followed the operation. In commenting upon these cases Dr. Tiffany states: "They seem clearly to indicate that liver hæmorrhage, so much dreaded hitherto, is amenable to pressure applied directly upon the bleeding surface, in that regard resembling the kidney." The exclusion of the liver surface by the method adopted exposes it to the surgeon for treatment as any other external surface of the body. In cases of shot- or stab-wounds, contusions or crushes of the liver, this procedure affords a means of arresting hæmorrhage and provides a method of continuous drainage. So easy is the performance of the operation that the author thinks it may even be of use as a diagnostic measure.

Hepatectomy—Extirpation of a Constricted Portion of the Liver.—Langenbuch,⁴ reports a case in which he performed laparotomy and removed a constricted portion of the liver as large as the fist. The patient, a woman, aged thirty years, had suffered for eight years from abdominal pain, most marked when in the recumbent position, at which time also palpitations and a feeling of fear supervened. A swelling the size of the fist could be felt in the upper part of the abdomen, extending from the ensiform cartilage to within two and a quarter inches of the level of the umbilicus. The inner border of the swelling was thick, the surface was smooth, and it felt tough and elastic. Percussion was impaired, the dullness being continuous with that of the liver. Echinococcus or constriction of the liver caused by tight clothing was diagnosed. An exploratory incision in the abdominal wall revealed a large mass of the substance of the liver cut off by a deep constriction from the left lobe of the liver. The great pain and discomfort which had been experienced was explained by the position of the mass, which exerted pressure upon the pyloric portion of the stomach, the duodenum, pancreas, aorta, and several of the great ganglia and nerves of the sympathetic system. Several bands of connective tissue which united the mass to the main part of the liver formed pedicles and were ligatured carefully. Hæmorrhage having occurred in the evening after the operation, the abdominal cavity was opened, the clots removed, and a bleeding vessel tied. The patient recovered and remained well for a time, when ascites and œdema supervened. It was a question whether this condition was due to the high degree of hydræmia present or to diminution of the area of portal circulation. The abdominal cavity was tapped twice, when the patient is reported to have made a complete recovery. The portion of the liver removed weighed three hundred and seventy grammes (about twelve ounces), and the case demonstrates the feasibility of removing the lobe of a tight-laced liver when this gives rise to serious discomfort. As an explanation of the involvement of the left lobe of the liver, Langenbuch states that the patient had discarded the corset eight years ago at the time of her becoming pregnant, and had substituted a bandage which had made pressure on the liver, which had been displaced downward and forward by the corset.

Hepatorrhaphy.—E. A. Tscherning describes³⁹⁶ an operation

in which a long, movable, constricted portion of the liver was sutured to the abdominal wall, constituting a case of hepatorrhaphy. The patient, a woman aged thirty-six, had suffered from jaundice, and had observed for five years a swelling on the right side of the abdomen, which gradually increased in size, and which was attended with such pain that she could not perform her household duties. The pain was of a darting, shooting character, subject to remissions and exacerbations, never entirely disappearing but relieved by rest in the recumbent position and increased by motion. On examination a tumor was felt occupying the lower part of the abdomen, extending from the right lumbar region to a point somewhat within the line of the nipple, and from the anterior superior spinous process of the ileum to the curvature of the ribs. Although the percussion dullness extended from the liver into that of the tumor, their connection could not be detected by manipulation. The left lobe of the liver was slightly enlarged. The surface of the tumor was somewhat irregular, smooth, and firm. Pulsation, fremitus, and friction sounds were absent. There was free lateral movement and slight tenderness on manipulation. The diagnosis being hepatic tumor, an incision opening the abdominal cavity was made from the twelfth rib to a point somewhat anterior to the anterior spinous process of the ileum. On division of the peritoneum the tumor was readily drawn to the wound and found to be of firm consistency, grayish white in color, and invested with a fibrous capsule. In order to determine its character an incision was made into its substance and interstitially degenerated liver-tissue was recognized. The hæmorrhage which ensued was controlled by deep sutures. On further examination the tumor was found to be a constricted portion of the liver firmly attached to the right lobe by a broad pedicle. Fixation was secured by the sutures carried deeply into the substance of the tumor and fastened in the abdominal wound. The peritoneal wound was packed with tampons after the method of Mikulicz to facilitate the formation of more extensive adhesions, and the extraperitoneal wound which had been made prior to cutting the parietal peritoneum for the purpose of exploration was sutured. Slight jaundice, albuminuria, and high temperature occurred after the operation. The patient was out of bed in four weeks and two weeks later left the hospital with the wound healed. Examination six months later found the patient

well and able to attend to her housework, suffering occasionally with slight dragging pains.

Hydatid Cysts of the Liver.—Ségon, of Paris, ⁶_{Apr. 14} considers the question of the surgical treatment of cysts of the liver as settled. A preliminary puncture with the aspirator should always be performed, as it establishes the diagnosis and may effect a cure. With regard to the operative plan of treatment of subdiaphragmatic hepatic cysts he believes that the transpleural incision with costal resection at one and the same time should be the one preferred. The dangers of this method of operation he also believes are not so great as those which attend the manipulations necessary to reach such cysts by the anterior incision. He thinks it unnecessary to perform either the transpleural or transperitoneal operation in two stages, and concludes that the transpleural opening of subdiaphragmatic cysts is a simple operation of not much gravity and very efficacious. Manoury reported the case of a woman affected with hydatid cyst of the liver on whom he operated by making an opening in the tenth intercostal space, incising the costal pleura, then the diaphragmatic pleura, and suturing the two flaps together so as to form a complete canal through the serous membrane. He then incised the diaphragm, exposed the cyst, opened it, and sutured the cut edges to the integument as in ordinary laparotomy. The operation was successful and the patient was cured. Pozzi reported the case of a woman, aged thirty-four, in whose case he performed complete extirpation of an hydatid cyst of the liver occupying the left lobe, the operation being an entire success.

Cholecystotomy with Ligature of the Cystic Duct.—Zielewicz ³³⁸_{No. 13} reports a case of cholecystotomy in which he applied a ligature to the cystic duct with complete success. The case was one of cholelithiasis with empyema of gall-bladder in a woman, aged forty-seven, in whom a tumor, elastic and movable, as large as the fist, could be felt about three inches below the liver. The abdomen was opened by an incision in the linea alba over the tumor and an attempt was made to remove the distended gall-bladder, which the tumor proved to be. Owing to the free bleeding which occurred this was abandoned and a double ligature applied to the cystic duct and division of the duct made. The section of the duct rendered the gall-bladder more movable, so that it could be readily

drawn to the abdominal incision, to which it was sutured by silk sutures. The bladder was now opened, the fluid evacuated, and a gall-stone as large as a walnut, with a rough mulberry surface, was removed. The operation lasted an hour and was followed by severe collapse, which was relieved by subcutaneous injections of ether and rectal injections of common salt for some time. The patient recovered rapidly. The author records this as the first successful case of ligature of the cystic duct in the human subject, and regards the combination of cholecystotomy with ligature of the cystic duct as a specially valuable method of treatment for the following reasons:—

1. There is complete recovery without the annoyance of a biliary fistula. 2. The operation is simpler and less dangerous than cholecystectomy and yields the same results.

Cholecystenterostomy.—At a meeting of the Medicinische Gesellschaft in Basel, Socin²¹⁴_{No. 15} read a paper on a successful case of cholecystenterostomy performed by him on a patient, aged fifty-one, with a complete obliteration of the bile-duct and consequent dilatation of the gall-bladder. The abdomen was opened by a free incision along the outer edge of the right rectus muscle, the gall-bladder incised, four hundred cubic centimetres of bile free from concretions evacuated, an incision three centimetres in length made in the jejunum, and the intestinal wound sutured to that in the gall-bladder. In three days a normal evacuation of the bowels occurred, jaundice rapidly disappeared, and in forty-one days the patient's weight increased from ninety to ninety-nine pounds. The operation of cholecystenterostomy was proposed by Nussbaum and first practiced by Kappeler. The case above reported is the second one on record.

Lawson Tait, ⁶_{Apr. 14} in presenting his last series of operations on the gall-bladder, eleven cases with one death, concludes his report by calling attention in the first place to the absence of suppuration in cases of multiple gall-stones and of its presence in the solitary gall-stone with the complications which are apt to attend this form, friable and contracted walls of the gall-bladder and the formation of adhesions to the deep structures. He says, further, that the one question still under discussion for the surgical treatment of gall-stones is, as to whether the gall-bladder should be removed or not. He cannot think it worth while to discuss the

fanciful operations of stitching the gall-bladder to pieces of intestine. Such operations would not be possible in cases where they would be most required—those of suppurative cholecystitis; in fact, in the majority of cases where he has operated in the presence of suppuration of the gall-bladder, such operations would be perfectly impossible. In cases of multiple gall-stones without suppuration he does not think cholecystenterostomy desirable. He therefore limits his remarks to the question of removing the gall-bladder or of simply stitching it to the abdominal walls. The operation of cholecystectomy in cases where adhesions to deep structures exist he regards as a terrible proceeding, and one which, in a majority of cases, could not be completed. The only argument in its favor is a supposed possibility of the return of the disease, and the experience derived from his cases, dating from September, 1878, shows this to be unfounded, as he cannot find in any of them the slightest indication of recurrence. In all of his operations he has secured the base of the gall-bladder in the cicatrix, and should the necessity for opening the gall-bladder a second time occur it can be easily done with a bleeding-lancet. Cholecystotomy he believes meets all the indications present in operations upon the gall-bladder.

I desire to direct attention to the fact that cholecystenterostomy is advocated only in cases where the common bile-duct is obliterated or occluded in such manner as not to be relieved. In such cases the operation provides a route for the bile into the intestine, and in successfully accomplishing this result its value cannot be overestimated.

PANCREAS.

Karl Hagenbach,³⁰¹_{Dec. 27, '87} in a paper in which he discusses the complications produced by diseases of the pancreas, reports two cases in which fatal results followed operative interference. Laparotomy in one of the cases revealed a large retroperitoneal pancreatic tumor compressing the duodenum and transverse colon, the latter being occluded by a band of adhesions. The band was divided and a mass of fæces broken up and pressed onward by the fingers through the wall of the bowel and the abdominal wound closed. Death from shock followed in six hours. Primary carcinoma of the pancreas existed in the second case with occlusion of the common bile-duct, as the result of pressure and consequent

enlargement of the gall-bladder. Cholecystotomy was performed with formation of a biliary fistula, the gall-bladder being opened two days after suture to the abdominal incision. Double hypostatic pneumonia developed and the patient died six days after laparotomy. The author appends a table of fifteen cases of cysts of the pancreas which he has collected: Eight males, seven females, with ages ranging from sixteen to forty-six years. In one-third of the cases the symptoms existed for more than five years with the presence of a tumor, and in one twelve years; in one only a short period occurred—five weeks. The chief symptoms were similar in all cases and were pain in epigastrium, tenderness, eructations, vomiting, constipation, emaciation, followed later by the development of a painful, elastic, fluctuating tumor in the upper portion of the abdomen, often presenting pseudo-pulsation. Contrary to the views of Frederich, Klebs, and Küster, he does not regard the presence of blood in the fluid removed from tumors in the upper abdomen as characteristic of pancreatic cysts. In his examination of the fifteen cases he found in four no trace of blood; in six slight hæmorrhage staining; in one the blood was apparently due to accidental venous bleeding of the cyst-wall; in two the fluid was brownish red; and the remaining two he thinks were “hæmatoma.” Hæmorrhagic tumors due to bleeding into previously formed cysts and ordinary cysts of the pancreas, the author believes, can be treated successfully by incision and drainage or tamponing. Apoplectic cysts, those formed by circumscribed extravasation of blood into pancreatic tissue in a state of degeneration, as well as neoplasms, are not amenable to treatment. An analysis of twelve cases of occlusion of the bowel by pressure of pancreatic tumors is given by the author, and also comments upon the operative treatment of occlusion of the common bile-duct from the same cause.

W. S. Tremaine¹¹⁷²_{v.3} records a case of cyst of the pancreas which resulted from a severe injury over the upper region of the abdomen, the patient having been caught between the draw-heads of two railroad cars. A careful chemical and microscopical examination of a small quantity of fluid removed with a hypodermic syringe established the diagnosis as a cyst of the pancreas. The chemical analysis demonstrated the presence of chloride of sodium, albumen, and sugar, with the spectroscopic

examination negative, a slightly alkaline reaction, specific gravity of 1.0075, and emulsion of cod-liver oil by admixture with the fluid in the proportion of one-tenth its volume. The symptoms of pain and "burning distress" in the epigastric region, frequent vomiting, great and rapid emaciation, constipation, pulse one hundred and normal temperature, were present with the development in two months after the accident of a tumor in the upper abdomen extending from the ensiform cartilage to the umbilicus. The manipulations employed during the physical exploration evidently caused a rupture of the cyst, as they were followed by violent pain, copious vomiting, and collapse. Laparotomy was promptly performed, the abdomen being opened by a median incision midway between the ensiform cartilage and umbilicus. Free fluid similar to that removed by the syringe was found in the cavity, and the collapsed cyst could be felt lying behind the stomach and below its greater curvature. The fluid was removed by turning the patient on his side and compressing the abdominal walls. The ragged edges of the cyst were stitched to the peritoneum, the abdominal wound closed with aseptic silk sutures, and dressed with iodoform gauze. Nine days after the operation there were evidences of the refilling of the cyst and the lower angle of the wound was reopened, giving exit to an ounce and a half of fluid. A drainage tube was now inserted, and from this time the patient rapidly improved, the discharge gradually diminishing. Three months subsequently he was well, fat, and apparently completely cured.

SPLEEN.

Abscess of the Spleen.—L. Vaughan Parry²_{M.B. 17} reported a case of abscess of the spleen, occurring in a patient in the Liverpool Royal Infirmary, which was treated successfully by a free incision and introduction of a large drainage tube by Mr. Reginald Harrison. A fluctuating tumor occupied the left lumbar region, extending downward four inches below the last rib and continuous with the splenic dullness. Examination of the blood showed an abnormal amount of white corpuscles. Nineteen ounces of dark chocolate-colored fluid were withdrawn with the aspirating needle, containing multitudes of altered red corpuscles and leucocytes. A second and a third aspiration was performed, removing twenty-three ounces of fluid similar in character to that first evacuated. Surgical

measures becoming now imperative, Mr. Harrison was called into consultation, and opened the abscess by a free incision made parallel to the last rib. On reaching the subperitoneal fat and connective tissue, the finger was passed underneath the rib in an upward direction, when it entered a cavity containing a large quantity of pus. The opening was enlarged by the finger, and thirty ounces of pus containing masses of disintegrated tissue, which on microscopical examination proved to be splenic, were evacuated. A large drainage tube was introduced, after the abscess-cavity had been washed out with a weak solution of carbolic acid. Later a second incision was made near the first to facilitate drainage. The patient's recovery was somewhat retarded by the development of an independent abscess in the inguinal region, which was promptly relieved by an incision.

Lauenstein⁶⁹_{Dec. 22, '97} reports a case of abscess of the spleen which he opened with the thermo-cautery after having resected the ninth rib. An enlargement of the spleen, accompanied by chills and fever with pain in the splenic region, followed an attack of typhoid fever. Having diagnosticated an abscess of the spleen, he passed an aspirating needle through the eighth intercostal space in the line of the axilla, the pleura, and the diaphragm into the spleen. On withdrawing the needle pus escaped through the cannula. The latter being left *in situ*, he resected a portion of the ninth rib about three inches in length. The abscess was then opened with the thermo-cautery and the edges of the wound were temporarily secured by tenacula to the chest-wound, while the abscess-cavity, about the size of a goose's egg, was washed out with a cold solution of salicylic acid and tamponed with iodoform gauze. The chest-wound was dressed with an antiseptic dressing. In six weeks the patient recovered, the abscess-cavity being filled with granulations, and the thoracic wound cicatrized. The author believed the abscess to have been embolic in character.

Splenectomy—Hydatid Cysts.—Fehleisen⁶⁹_{No. 24} places on record two cases of successful total extirpation of the spleen for hydatid cysts. In the first case, operated on by von Bergmann, the diagnosis lay between a large and movable cyst and a wandering spleen. Enlargement of the glands or alteration in the blood did not follow the operation. The patient made a prompt recovery and has remained well. An uninterrupted recovery followed in the second case.

Wandering or Floating Spleen.—A number of successful operations for the removal of wandering or floating spleens have been reported during the past year. The case recorded by T. A. McGraw has a special interest in the subsequent expectoration of the ligature of the pedicle, which he thinks came away by a process of absorption rather than of suppuration and abcess, working its way through the diaphragm and pleura into the lung tissue, being finally expectorated.

Asch⁸⁵_{BM, 12, H. 1} reports two cases of splenectomy performed by Fritsch. The first case was that of a woman, aged thirty-one, the condition of whose womb indicated that she was in the first month of pregnancy. There was no alteration of the blood, the proportion of white to red corpuscles being normal. The rapid growth of the tumor, with the healthy condition of the organs, made the diagnosis of neoplasm of the spleen, probably sarcoma, easy. Laparotomy was performed by an incision four inches in length, beginning two inches above the umbilicus and passing to the left. There were no adhesions and the tumor was readily removed, the pedicle transfixed and tied, and the abdominal wound closed. In three weeks the patient was discharged cured. After the operation there was slight swelling of the axillary and inguinal glands, but none of the thyroid, and the blood remained normal. Pregnancy terminated at full term with the birth of a dead child. The tumor weighed five and a half pounds and microscopic examination showed it to be a lympho-sarcoma.

In the second case, a woman aged twenty-six, the entire abdominal region of the left side of the ribs to the brim of the pelvis was occupied by a smooth, hard swelling, which, appearing first as a painful nodule in the splenic region, had rapidly increased in size. Examination of the blood showed the relation of the white corpuscles to the red as one to eight. Laparotomy was performed by an incision six inches in length in the median line, and the tumor, which was free from adhesions, except at one point to the intestine, where a slight adhesion existed, was pressed out of the cavity and the moderately broad pedicle was ligatured in sections and then severed. Before closing the abdominal wound a careful examination was made, and no bleeding points could be found. Four hours after the operation dyspnœa suddenly developed and continued until the respirations became gasping and the patient

expired. The tumor weighed sixteen pounds and was an example of leucæmic hypertrophy. The autopsy revealed a large coagulum in the subcutaneous connective tissue about the wound; numerous scattered subperitoneal hæmorrhages in the region occupied by the spleen and into the great omentum; the peritoneal cavity was filled with reddish-brown blood. A table of ninety splenectomies is appended by Asch, of which number fifty-one were successful. Of the thirty-nine unsuccessful cases, twenty-one were operations for leucæmic spleen, and in all but one the cause of death was hæmorrhage. The remaining eighteen were for the removal of large splenic tumors, probably also leucæmic. Asch believes that the danger in the operations for removal of leucæmic spleens is in the size of the tumor, and that in these cases the operation should be performed early.

KIDNEYS.

Rupture of the Kidney.—At the meeting of the Calcutta Medical Society, June 20th, Chuckerbutty²⁰⁶_{July} reported a case of rupture of the left kidney in which laparotomy was performed. The patient, a Hindu boy, aged sixteen years, fell over the lower piece of a door-frame and injured his left loin. He got up by himself, but immediately fainted, remaining unconscious for two or three minutes. An hour after the accident he passed bloody urine, and continued to do so until he entered the hospital, ten days later. At that time there was a large swelling on the left side of the abdomen reaching as far as the umbilicus in the middle, the lumbar spine on the back, and the crest of the ilium downward. The swelling was painful on pressure. The urine was blood-stained and mixed with a few decolorized blood-clots. Under the administration of turpentine the hæmorrhage ceased and the urine became clear. A week later the urine became again bloody, and the size of the tumor increased. Laparotomy was now decided upon, and the position of the kidney was reached by a semicircular incision in the left lumbar region. About eight ounces of blood-clots were removed by the finger from the cavity of the hæmatoma, which seemed to be formed by the capsule of the kidney. As hæmorrhage was not taking place, the cavity was washed out with bichloride solution and a large drainage tube inserted into it, the deeper portion of the wound sutured with catgut, the superficial with horse-hair, and the wound dressed

antiseptically. Turpentine and an infusion of buchu were administered, and five days after the operation the urine was clear. Urine passed through the wound for some days. At the end of seven weeks the patient was discharged cured.

Willard¹¹⁷² reports a case of gunshot-wound of the kidney, in which nephrectomy was performed. The bullet, fired from a twenty-two-calibre pistol at close range, entered just above the eleventh rib, three and a half inches from the spinous processes. No wound of the exit could be found. In voiding urine he passed twelve ounces of almost pure liquid blood. When seen four hours after the accident by Dr. Willard, blood was flowing from the urethra, and pain in the left inguinal region was very great. On percussion, the whole left lumbar and inguinal regions were absolutely flat, and an apparently hardened mass occupied the entire left side of the abdomen. This dullness did not alter by change of position, and was decided to be blood, with perhaps urine and fæces, that had escaped into the peritoneal cavity. The abdomen was distended and tender, especially upon the left side, where pressure gave intense pain. The diagnosis of wound of the kidney was made with possible involvement of the other organs of the abdominal cavity, and therefore nephrectomy, by the anterior incision, was decided upon as the one offering hopes of reaching the wounded kidney, and at the same time suturing any wounds of the intestines and cleansing thoroughly the peritoneal cavity. On opening the abdomen the bladder and left ureter were found full of blood. A large mass of blood was lying retroperitoneal about the kidney. Tearing through the peritoneum and turning out the mass of partially coagulated blood, the wounded kidney was brought into view, and it was found that the ball had traversed the entire width, emerging at the hilum and cutting the pelvis and renal vessels. A strong aseptic silk ligature was applied about the vessels and ureter, and the structures then divided. The cavity being thoroughly cleansed, the peritoneum was sutured with catgut sutures, and the abdominal wound closed with sterilized silk and dressed with sublimate gauze. The patient died on the fourth day after the operation, and on post-mortem examination the ball was found beneath the sheath of the aorta just at the origin of the renal artery. In the discussion which ensued Dr. Tiffany took the ground that wound of the kidney does not necessarily involve its

removal. No one hesitates to cut into a healthy kidney and explore it with finger or into a suppurating kidney and drain it. Simple wounding of the kidney substance without wound of the artery, ureter, or vein does not demand nephrectomy. A lumbar incision should be made, the kidney drained, and allowed to heal by granulation.

Nephrorraphy.—M. H. Richardson,⁹⁹ describes a case of nephrorraphy for movable kidney with complete relief of symptoms, and gives a *résumé* of the operation from that of Grenville Dowell in 1879 to the present day. Before 1878 much had been written, but little had been done to relieve the symptoms caused by movable kidney beyond the adjustment of various pads and appliances to keep the organ in its proper position. Dr. Dowell's operation consisted in the introduction of a seton through the kidney and out of the abdominal wall. Some hæmaturia ensued and the seton, which remained in place three months, caused persistent and offensive discharges. A second seton was introduced, the first having broken, but permanent relief did not follow its use. Subsequently nephrectomy was performed successfully by Smyth, and a cicatrix two and a half inches long was found upon the kidney. Hahn, in 1881, published the report of operation for two cases of movable kidney, and described his method of fixing the organ by the lumbar incision, to which he gave the name of "nephrorraphy." The results in these cases having been unsatisfactory, he recommended that the fatty capsule be opened and separated from the kidney and stitched to the wound, and the kidney fixed low down. In reviewing the operation of Hahn, Wagner, in 1888, states that while it will take years to estimate the value of this operation, yet, on the other hand, a series of very good and lasting results have been gained by the harmless nephrorraphy, so that we can never agree to extirpation of a healthy movable kidney till nephrorraphy has been tried. Landau has shown that a movable kidney was not in itself dangerous to life, and that there was no case cited in literature of death due to a movable kidney. Billroth and Czerny have maintained the position that the indication of nephrectomy on movable kidney should be limited as much as possible, and that it will be the work of the future to fix the offending movable kidney by surgical means and not to destroy an organ whose function is normal. Niehans advocates the use of the bandage, and pro-

poses one used in a case of his own with immediate and beneficial effects. Other cases are reported by surgeons in which the bandage has been of service. Dr. Richardson employed Hahn's method in the operation upon his patient, suturing the capsule of the kidney to the edges of the lumbar incision, which was six inches in length and was made along the margin of the quadratus lumborum. It was found impossible to fix the kidney in its normal position, and therefore it was fixed two inches lower down. In this case mechanical appliances had been tried unsuccessfully. In conclusion, Dr. Richardson thinks that the opinions expressed by the authorities quoted in his article present most fairly the present aspect of the best treatment in these cases—namely, that in many cases, if not in most, no interference is demanded or justified beyond the application of a pad. In some cases even this is not necessary, as there are no symptoms. If the symptoms are unendurable, then nephrorraphy can be done with little danger to life and with a very good chance of permanent recovery, or, at least, enough lasting benefit to justify the operation. Finally, if fixation has not followed, nephrectomy can be resorted to as a remedy for unbearable pain and distress.

Nephrectomy.—The question of unilateral kidney and nephrectomy was discussed at an English Medical Society,²² after the presentation of a kidney, which had been removed post-mortem, and which proved to be the only one which could be found. The practical question which arises relates to the means at our disposal for recognizing the absence of one kidney before proceeding to remove the other. The ventral incision affords an opportunity of ascertaining the presence of both kidneys. Henry Fenwick, who has made the "vesicoscope" a study, claims that it is easy to watch the flow of urine through the ureter into the bladder, thus affording positive proof of the existence of a duplicate secreting organ. The existence of both kidneys might also be inferred, if a patient with serious disorganization of one kidney presented no general symptoms of uræmic intoxication, thus proving that excretion was being carried on by the other organ. The subject is one of great importance, and should claim the earnest attention of surgeons, as the performance of nephrectomy in a case of unilateral kidney would inevitably and promptly cause the death of the patient.

Schmidt⁴_{Oct. 18} reports Bardenheuer's results with nephrectomy from 1879 to 1888. During this time thirty-five nephrectomies and two nephrotomies were performed. Nephrectomy was performed in twenty-three cases for tuberculosis, abscess, pyonephrosis, and pyelitis; in four instances for tumors; in eight for hydronephrosis, cystic kidney, and injury to a ureter during amputation of uterus. Eight patients died in the first two weeks, two at a later date; the operation caused death in one, sepsis caused death in two, and collapse in one. Both nephrotomies for hydronephrosis and for pyonephrosis terminated fatally. In tuberculosis, abscess of the kidney, and pyonephrosis, usually a typical form of perinephritic abscess occurs. Schmidt and Bardenheuer consider nephrectomy indicated in suppuration of the kidney, as this condition is the primary affection and the perinephritic abscess the secondary. Bardenheuer cuts directly through the thickened capsule into the renal tissue and shells out the abscess, permitting the capsule to remain. By this means infection is prevented, and the firm capsule prevents collapse of the walls of the cavity. Permanent or transient, partial or total, closure of a ureter are causes concerned in the production of pyelitis, hydronephrosis, and pyonephrosis. Section of a ureter during operation on other organs demands nephrectomy. Krönlein, in discussing the above paper, objected to indiscriminate performance of nephrectomy, and gave nephrotomy its proper position.

Von Frisch¹¹⁸_{Mar. 25} exhibited at the meeting of the Society of Physicians of Vienna a patient from whom four weeks before he had extirpated the left kidney for sarcoma. The abdomen was opened by an incision from ensiform cartilage to the umbilicus, and a second incision at right angle to the first. There were many points of adhesion which required separation. The pedicle and bleeding points were ligatured. The tumor weighed six pounds, and proved, on microscopic examination, to be a round-celled sarcoma containing giant cells. Prompt recovery followed.

At a recent meeting of the Anatomical Society of Paris, Tuffier¹⁴_{May} stated that he had undertaken some experiments to determine the minimum quantity of kidney substance which is necessary to life. After a total right nephrectomy, he had performed two partial left nephrectomies upon a dog, which had at once recovered. The resected kidney quickly cicatrized, and the

loss of substance has in great part been filled in by epiploic adhesions.

The records of surgery of the kidney for the past year, as presented in the current medical literature, confirm, in every respect, the conclusions of Gross, which were reported in the *ANNUAL* of 1888.

HERNIA.

The discussions at the Third French Congress of Surgery in Paris and at the annual meeting of the British Medical Association have contributed largely to improvement in treatment. In the first, Routier, Trélat, Molière, Boeckel, Lucas-Championnière, Schwartz, Léonté, Socin, Ségond, and Richelot, men who have had considerable experience in the surgical treatment of hernia, agreed ⁹¹_{Apr. 10} that the operation, performed under strict antiseptic precautions, presented no danger in simple cases. The danger only exists in very old subjects, when the hernial tumor is so large as to ulcerate the integuments, or when the removal of a large part of the omentum is necessary.

Different Methods of Operating.—Socin's operation ⁹¹_{Apr. 10} for the radical cure of hernia consists in the total extirpation of the hernial sac above its neck. He thinks that approximation of the pillars by sutures is only exceptionally required. In congenital hernias the dissection of the hernial sac may give rise to some difficulties. It succeeds, however, in the majority of cases. If there is ectopia with atrophy of the glandular tissue, the testicle must be removed with the sac.

Lucas-Championnière ⁹¹_{Apr. 10} removes the sac completely at a point as high up as possible and insists upon the most thorough attention to every antiseptic detail.

Keetley ⁹⁶_{July} has collected and described some more of the methods employed: Léonté, of Bucharest, drags down the sac until its abdominal orifice is visible. Just above this point he divides the peritoneum by a circular incision, and the serous edges become wrinkled, thus tending to close the internal aperture. The internal ring is drawn together by a circular suture, and the interior of the sac scraped with a sharp spoon or irritated with chloride of zinc or carbolic acid. A silver wire or silk suture is then passed through the integument and the sac.

Macewen's operation, which has been performed by him fre-

quently during the last ten years,⁹⁶ differs from the other methods, as he does not remove the sac, but forms it into a pad, which is returned through the canal and placed on the abdominal aspect of the internal ring. He endeavors to carry the conjoint tendon outward toward Poupart's ligament, and to unite with the transversalis and internal oblique muscles, for when the conjoint tendon is approximated to the outer pillar of the external ring the abdominal wall is thinned and the natural valve, which the canal forms, is to a great extent obliterated.

Banks' operation, although Mr. Banks makes no claim to originality, seems to be the one now in general favor, because it is the simplest that has been devised. In the case of inguinal hernia, he dissects out the sac, replaces the bowel, and ties and cuts away all adherent omentum. The sac is then pulled down, ligatured high up and removed, and finally the pillars of the ring are drawn together by silver sutures. In femoral hernia the sac is dissected away and removed, but no attempt is made to close the femoral opening. In ventral and umbilical hernia he frequently makes use of the whole or part of the sac as a kind of plug to spot the aperture, which is generally large, and in which it is seldom possible to adopt any means likely to be permanent of approximating the edges.

Arthur Barker clears the neck of the sac around the level of the external ring and ligatures it, after opening it to see that it is empty. It is then divided half an inch below the ligature, the scrotal part being left to take care of itself. One of the threads hanging from the stump of the neck of the sac is now threaded in a Liston needle, and the latter is passed up the inguinal canal in front of the vas, guided by the left index finger, which pushes the stump of the sac before it and feels for the inner aspect of the abdominal opening, that is, the internal ring. Here the needle is forced through one border of the ring and out through the external oblique muscle. It is then unthreaded and withdrawn, and is again filled with the other thread hanging from the stump of the sac. This is now carried in the same way as the first up the inguinal canal through the border of the opening opposite to that in which its fellow already lies, and through the external oblique as before. Both threads being now pulled upon, the stump of the sac is drawn well within the abdomen, and when the threads are

knotted securely the first step, namely, that of closing the internal ring, is complete. Finally, the walls of the canal are approximated by from four to seven silk sutures.

Keetley, himself, is in favor of injections into the canal. He believes the operation by injection to be far the safest and easiest of performance, though it cannot compare in its results with operations involving mechanical interference with the sac and canal. The latter, however, is not an operation to be lightly undertaken, and is safe in the hands of only a few experienced and careful operators.

Diaphragmatic Hernia.—G. Naumann³⁷⁰_{Aug. 8} reports a case of diaphragmatic hernia on which he performed laparotomy. He found that nearly the whole sigmoid flexure and the large omentum had disappeared through the diaphragm. All the efforts to effect a replacement were useless, either through the stomach turning on its axis or the sigmoid flexure. The patient died the same day after the operation. Naumann attributes the fatal result, in the first place, to the atmospheric pressure of the air, and, in the second place, to the negative pressure in the pleural cavity. He prefers laparotomy, not making the incision too large, to the resection of ribs.

W. G. Farwell,⁶_{Jan. 30} presents the notes of a case of traumatic diaphragmatic hernia with very interesting features. Examination of the patient, who was caught between the buffers of two trucks, revealed no symptoms; there was no bruising of the skin or abdomen, no dyspnoea, no ribs were broken, but there was great collapse. Sudden paroxysms of pain, spasmodic in character, continued for several weeks without any other symptoms. He recovered sufficiently in six weeks' time to resume work. The most remarkable feature is, that he lived sixteen years after receiving the injury. A post-mortem examination showed the stomach and some small intestine lying upon the left lung, which was only one-fifth its usual size, but healthy otherwise. On examining the diaphragm, a large opening was discovered, through which three fingers could easily be passed. The situation of the opening was a little to the left of the median line, and just behind the central tendon.

Umbilical Hernia.—Stolypinsky, of Kazan, Russia,⁶⁹⁸_{Nov. 24} gives the record of a case of congenital umbilical hernia in a newborn

infant, successfully treated by a radical operation. A tense umbilical hernia, of the size of a goose's egg, was noticed directly after the birth of the otherwise healthy child. The cord was ligatured and divided about four fingers' breadth above the swelling. To reduce the hernia by means of taxis was without result, the umbilical ring being very narrow and tight. A radical operation was then decided upon. Accordingly, the girl, when ten minutes old, was brought under the influence of chloroform (by a couple of whiffs), and washed with soap and borax, after which an incision three centimetres long was made, upward from the umbilical ring and somewhat to the left of the linea alba. The peritoneum having been opened, all the knuckles protruding could easily be returned into the abdomen, except one loop, which was intensely inflated and also firmly adherent to the hernial sac, and which proved irreducible even after an enlargement of the abdominal wound. The reduction could be effected only after dissecting away a piece of the sac, which was then left in connection with the adherent loop. The whole hernial sac having been excised close to the umbilical ring, the abdominal wound and the ring were closed with four deep and three superficial silk sutures, while the peritoneal layer, in addition, was stitched together with interrupted catgut sutures. The wound was then dressed with a simple pure gauze compress, adhesive plaster, and gauze roller. The infant bore the operation very well. On the eighth day all the sutures were removed. The wound was found closed *per primam* on the sixteenth day. On the seventeenth day the patient was discharged.

Rhu¹¹⁵_{Aug.} reports a case of strangulated umbilical hernia, in a woman fifty-three years of age, in which he performed a radical operation with good result. The case was one of from twelve to fifteen years' standing. The omentum was found adherent in numerous places to the old omental hernial sac. The adhesions were detached, the ligations done with catgut, intestines and omentum returned, the edges of the stricture freshened. The peritoneum was brought together with catgut sutures, the abdominal walls with silk sutures.

About six weeks from date of operation the patient was up and well.

D. Hayes Agnew¹⁹_{Sept. 15} relates the case of a woman with strangulated umbilical hernia. Laparotomy, with excision of a portion

of the ileum, was performed. The color of the intestine was found to be dark black, with bloody serum oozing from its surface. The omentum was in a condition not fit to be replaced, and the mass was removed and fourteen inches of the disorganized bowel excised, with a corresponding part of the mesentery divided in a V-shaped manner. After careful ligation of the vessels, the cut ends of the intestine were brought together and united by a series of Lembert silk sutures. The intestine was then returned into the abdomen and the parietes closed by a number of interrupted sutures. The patient died the next day after the operation.

Professor Agnew thinks it would have been better, instead of stitching together the ends of the intestine, to have brought them out of the external wound and to have attached the half circumference of each of the parietes preparatory to another and later operation for re-establishing the continuity of the intestinal canal.

Ventral Hernia.—Wertheimer,¹⁰⁸ in an elaborate paper on this subject, arrives at the following conclusions:—

1. Ventral hernia may be a consequence of laparotomy.
2. The production of a direct hernia on the level of an abdominal cicatrix depends upon the condition of the abdominal walls, size of the tumor, upon the situation and extension of the incision, treatment of the pedicle, sutures applied, etc.
3. These hernias are exposed to complications and accidents, which may be caused by hernias of other varieties.
4. In these hernias, which reach a considerable volume and in consequence become irreducible and possibly strangulated, surgical interference is justified.
5. The resection of the sac should be practiced and the wound resulting from the excision should be sutured and treated like any other wound of the abdominal wall.

W. and J. Mayo¹⁰⁵ report a successful operation for a large ventral hernia. A multilocular ovarian cyst, thirty-two pounds in weight, was removed from the patient, a weakly girl of seventeen years, five years before. The tumor involved the left ovary.

The year following, the patient, then a married woman, was delivered of a large boy. The cicatrix was ruptured by the weight of the pregnant womb and the entire uterus anteverted into the ventral hernia thus formed between the recti muscles.

Sixteen months later she was again delivered at term, leaving the hernial sac still larger and constantly filled with intestines.

In December, 1886, the left ovary became cystic and grew to enormous size, filling the abdomen and hernial sac.

In January, 1888, a multilocular cyst was removed through a five-inch incision without special difficulties. Catgut ligatures were used on the many vascular adhesions and braided silk for the omental stump and left broad ligaments, which formed the pedicle. The tumor weighed sixty-two and a half pounds. This procedure was followed by the removal of the entire hernial sac, consisting of peritoneum, skin, and dropsical cellular tissue. The size of the sac equaled that of an ordinary wooden pail. The incision reached from two inches above the umbilicus down to the pubes. The abdomen was flushed with hot water. The peritoneum and recti muscles were sutured with buried, interrupted, catgut sutures. The skin was sutured separately and in a like manner. There was no discharge and the drainage tube was early removed. The recovery was prompt and the result all that could be desired.

Inguinal and Femoral Hernia.—In 1883 Küster wrote an interesting paper on the treatment of wounds under the dry aseptic scab, mentioning at the same time his method of operating for hernia. This, last year, he again calls attention³³⁶_{Mar. 17} to, and advocates his operative procedure. It consists in opening the sac in the usual way, restoring the bowel to the abdominal cavity, cutting off the sac, and stitching the edges carefully. After this the hernial opening is stitched and the rest of the wound closed by successive rows of continuous catgut suture, so that there is no space left for any accumulation of blood or serum between the cut surfaces. After the skin is sutured, the wound is painted with iodoform collodion until no blood can come through the coating. After this no further dressing is applied.

Küster maintains that this method accomplishes all the objects of the usual antiseptic method, while it is much simpler in its application than the latter. Its success depends largely upon the care with which the preliminary steps of the operation are carried out and the strictly aseptic condition of the wound before it is sutured. His opinion is supported by the results he

has obtained with it in thirty-three cases, in only two of which death followed the operation, and in neither of which was it attributable to the method.

Anderegg,⁴ who bases his observations on the collection of two hundred and seventy-three cases, on which the radical operation for free or non-strangulated hernia has been performed, estimates the mortality at 5.1 per cent. He finds that it lessens to 1.6 per cent. in subjects from eleven to forty years of age, while it increases to 8.3 per cent. below ten years, and to 8.1 per cent. above forty.

Dividing the inguinal hernias operated upon into three classes, he arrives at the conclusion that the mortality is 0 in small hernia, 6.9 per cent. in middle and large-sized hernias (from the size of a fist to the one of a child's head), while it reaches up to 29.4 per cent. in enormous hernias.

Strangulated Hernia.—While the surgeons differ in their opinion as to the advisability of a radical operation in non-strangulated hernias, they all agree that in strangulated hernias the radical operation should be performed early and long-continued taxis avoided.

Considering the question as to what is to be done if the operator meets with a gangrenous coil of intestine, Jordan Lloyd,³² in an elaborate paper, suggests the following procedures:—

1. Simply make a free opening into the gangrenous bowel and leave the constricting agent unmeddled with. The advantages claimed for this method are a minimum of interference and the avoidance of the risk of contaminating the peritoneal cavity by disturbing the structures lying within the neck of the sac. The disadvantages are that the symptom of fæcal obstruction, which is the death-determining factor in most strangulated hernias, is left unrelieved, and that fæcal fistula follows.

2. First find the constricting agent, to divide it thoroughly, and then proceed as in 1. This may be supplemented by anchoring the sloughy intestine to the wound edges, and by passing a large-sized drainage tube into the proximal distended intestine to let off its contents. The advantages of this method are its comparative safety and the immediate relief it gives to the fæcal obstruction. The disadvantages are the resultant fæcal fistula and

the disagreeableness induced by the presence of the sloughing gut for three or four days.

3. To divide the constriction as in 2, then to excise the whole of the gangrenous mass and stitch the healthy intestinal end to the wound edges. A drainage tube may be inserted here as in 2. The advantage claimed for this method is that we get rid of the sloughing intestine at once. The disadvantages are the resulting fistula, the greater time required, the greater disturbance essential to the operation, and the possibility of troublesome bleeding from the intestinal edges or from the mesentery.

4. To excise the whole of the gangrenous tissues, to suture the intestinal ends closely together, to return them back at once into the belly, and to complete the operation as in an ordinary uncomplicated hernia. The advantages here are the perfect and immediate restoration to healthy conditions of the parts concerned, faecal fistula and all its more imaginary than real attendant horrors being thereby avoided. The disadvantages are the great risk of intraperitoneal leakage from the joint, the prolonged time required for the operation, and the severity of the attendant shock.

E. Tscherning, of Copenhagen,³⁷³_{No. 22} has collected all the cases of strangulated hernia observed and treated during the last twenty-five years in the large Commune Hospital of Copenhagen, altogether the considerable total of five hundred and twenty-four. Two hundred and ninety-seven cases of *herniæ cruralis* were treated one hundred and sixty-five times by herniotomy (one hundred and sixteen living and forty-nine dead) and one hundred and thirty-two times by taxis (one hundred and twenty-four living and eight dead) the mortality being altogether 19 per cent. Two hundred and ten cases of *herniæ inguinalis* were treated one hundred and six times by herniotomy (seventy-seven living and twenty-nine dead) and one hundred and four times by taxis (ninety-seven living and seven dead), the mortality being altogether 17 per cent. The mortality of the cases treated by herniotomy varied very much in the different periods out of the twenty-five years, without the author being able to find that the relation between the frequency of herniotomy or taxis performed on the patient had any influence thereon. Dividing, however, the cases where herniotomy was performed at the very latest three days after the first symptoms of

strangulation, and cases when herniotomy was performed later, Dr. Tscherning found that mortality was lowest in those operated on early.

SURGICAL DISEASES OF THE GENITO-URINARY APPARATUS IN THE MALE.

By E. L. KEYES, M.D.,
NEW YORK.

DISEASES OF THE PREPUCE.

Phimosis.—During the past year there has appeared Lewis A. Sayre's admirable exposition, delivered before the Ninth International Medical Congress,⁴⁶² of his views concerning the importance of a tight prepuce, particularly if it be also in an irritated condition, in producing the most varied reflex disorders, which disorders may be removed by circumcision. Much documentary evidence is adduced, and Dr. Sayre's now well-known views are emphasized in his usual forcible style. In the same line of argument, Auguste Reverdin, of Geneva,¹⁸⁷_{Mar. 20} publishes an interesting essay upon circumcision, historical and practical, bringing up a number of cases in which varied reflex disorders were cured by ablation of the foreskin. His cases and citations cover coxalgia, moral and physical depression, hysteria, hypochondria, convulsions, nocturnal incontinence, vesical irritability, epileptiform attacks, partial paralysis, paraplegia, chorea, sterility—and even atrophy of the testicle. He speaks of the possible inoculation of tubercle by the old Jewish method of suction, a circumstance which has been already noted by others, as well as the inoculation of syphilis. The article also includes a considerable bibliography.

The great danger of the too great generalization of this idea that a tight foreskin may lie at the foundation of such a variety of disorders is the carelessness in the study of cases to which it conduces and the sometimes unnecessary surgery to which it naturally leads. That the idea has great value seems demonstrated by abundant and varied testimony, but that the irritative influence is very often overestimated is most clear in the minds of many who have seen the operation needlessly performed, the patient being often seriously disappointed by the failure of the promised relief, upon which he had been brought to found his hopes.

There is also a general essay of considerable pretension on "*Circumcisio Ritualis Hebræorum*," a practical and historical study by Messala Pogorelski,²¹_{Sept. 24} and many minor articles containing nothing new.

Vegetations.—A practical suggestion,¹⁰⁰_{Jan. 17} doubtless worth a trial on account of the weight of the man who advocates it, appears from the pen of Le Fort. It is to the effect that to remove vegetations satisfactorily from the genitals the best method is to very thoroughly scrape them away with one blade of a scissors, and then to touch the moderately bleeding base with the perchloride of iron. This method, he asserts, in his hands always cures radically, there being no relapse. I have used it twice, in very moderate cases, however, with satisfaction.

DISEASES OF THE URETHRA.

Gonorrhœa.—Several notices have appeared from various sources attesting the value of antipyrin as a controlling agent of the painful erections that occur during gonorrhœa. I have tried it a number of times and find that, like other remedies, it often fails. James P. Tuttle, of New York, informs me that he has successfully used sulphonal, thirty-grain (two-gramme) doses, for the same purpose. I have not yet tried this drug.

George E. Brewer, of New York,²⁴⁵_{July} records one hundred and two cases of urethritis, apparently of all varieties and unselected, in which treatment by mild, hot bichloride irrigation, and occasionally hot retrojection, effected cure in an average of thirteen days, at the Roosevelt Dispensary, inflammatory complications being more rare than after other methods.

Frank L. James, of St. Louis,¹⁰⁰_{Apr.} says that he has used many hundred times the following injection in acute urethritis with some failures, but generally with satisfaction and sometimes phenomenal success. In 60 per cent. of the cases treated he claims that it brought about "rapid and almost painless recovery:"—

R Quiniæ sulph.,	.	.	.	.	.	3 ½	(	2.	grammes).
Morph. sulph.,	.	.	.	.	.	gr. 8	(	0.52	gramme).
Mucilaginis acac.,	.	.	.	.	.	3 1½	(	47.	grammes).
Aquæ,	.	.	.	.	q. s. ad	3 8	(	248.	grammes).

M. Sig. : To be used four or five times a day.

He states that the injection is rarely of service in the late stages. I have not yet tested it. For chordee he is equally posi-

tive in asserting that nothing is better than twenty minims (1.32 grammes) of tincture of veratrum viride on retiring. The "United States Dispensatory" states that the commencing dose of this tincture "should not exceed from three to eight drops."

Rademaker, of Louisville, Ky., I find quoted¹⁷_{June}, ²¹⁶_{Feb.} as making the statement that gonorrhœa may be cured in three or four days by injecting a solution of a grain and a half (0.10 gramme) of pyridine to the ounce (31 grammes) of water. Dr. d'Héricourt²²_{Oct. 10} says that an efficient treatment of gonorrhœa is a 1 or 2 per cent. solution of tartrate of thallin in an aqueous solution of naphthol, one injection being used daily. In acute attacks the scalding is said to subside on the second day and the discharge to subside on the fifth or sixth, yet the treatment must be continued for some time. This treatment affords the most relief in acute cases. The conclusions are based upon experiments in forty cases. I have made no personal test of these two methods.

Nachtigal, of Stuttgart,¹¹⁶_{Feb.} praises the thallin antropore as the best treatment for gonorrhœa, stating that his former use of soluble bougies (zinc, lead, iodoform, carbolic acid, etc.) gave him cures in four weeks, using three a day, thallin bougies requiring three to four weeks (three a day), while with thallin antropores he gets as good results in two weeks, using two a day. He leaves them in for ten minutes, passing them, apparently, into the deep urethra. Brewer's experiments²⁴⁵_{July} with thallin bougies have been unsatisfactory. Hugo Lohnstein, of Zuelzer's polyclinic,¹¹⁶_{June} from experiments upon ninety-three cases, also speaks highly of the antropore. Thallin was the substance used, at first 2 per cent., later 5 per cent., introduced in acute cases into the pendulous, in chronic cases into the membranous urethra. He advises against their introduction into the vesical neck. In acute cases he claims cures in from eight to fourteen days. In chronic cases, when the seat of discharge is the deep urethra, he speaks with less confidence. Of the ninety-three cases, twenty-six were acute, thirty-nine subacute, twenty-eight chronic. Of the acute twenty-four, of the subacute twenty-eight, were cured. Out of the twenty-eight chronic, failure is reported in twenty-two. The treatment lasted from one to six weeks. The urethra was washed with Zuelzer's apparatus to clear off adherent mucus, a 2 per cent. boracic acid solution being employed. Chronic cases were first

treated with thallin; later, zinc, 5 per cent.; tannin, ext. krameria, 2 per cent.; silver nitrate, 2 per cent.; ammonia, sulpho-ichthyo-
late, 3 to 5 per cent. In 70 per cent. of the cases there was no complication. Lohnstein thinks the surgeon should always personally insert the antrophore. Fenwick, of London,⁶ uses 5 per cent. thallin antrophores. He has treated eighty cases of chronic gleet, and cured a large percentage in from three to five weeks.

A few were not favorably influenced, some were made worse.

The antrophore, after all this array of testimony in its favor, needs description for the benefit of those not yet familiar with it. It is a variety of soluble bougie, the original being, it seems, designed in Germany by Dr. Francke, and patented; but as it did not take, the patent was allowed to lapse. It is now, therefore, unpatented. The present form, etc., of the instrument is described² as follows:—

“Fig. 1 shows the construction of the bougie. The wire spring A⁴ C⁴ is coiled by a special machine, the wire that is used being tough and very resistant, any extra trac-

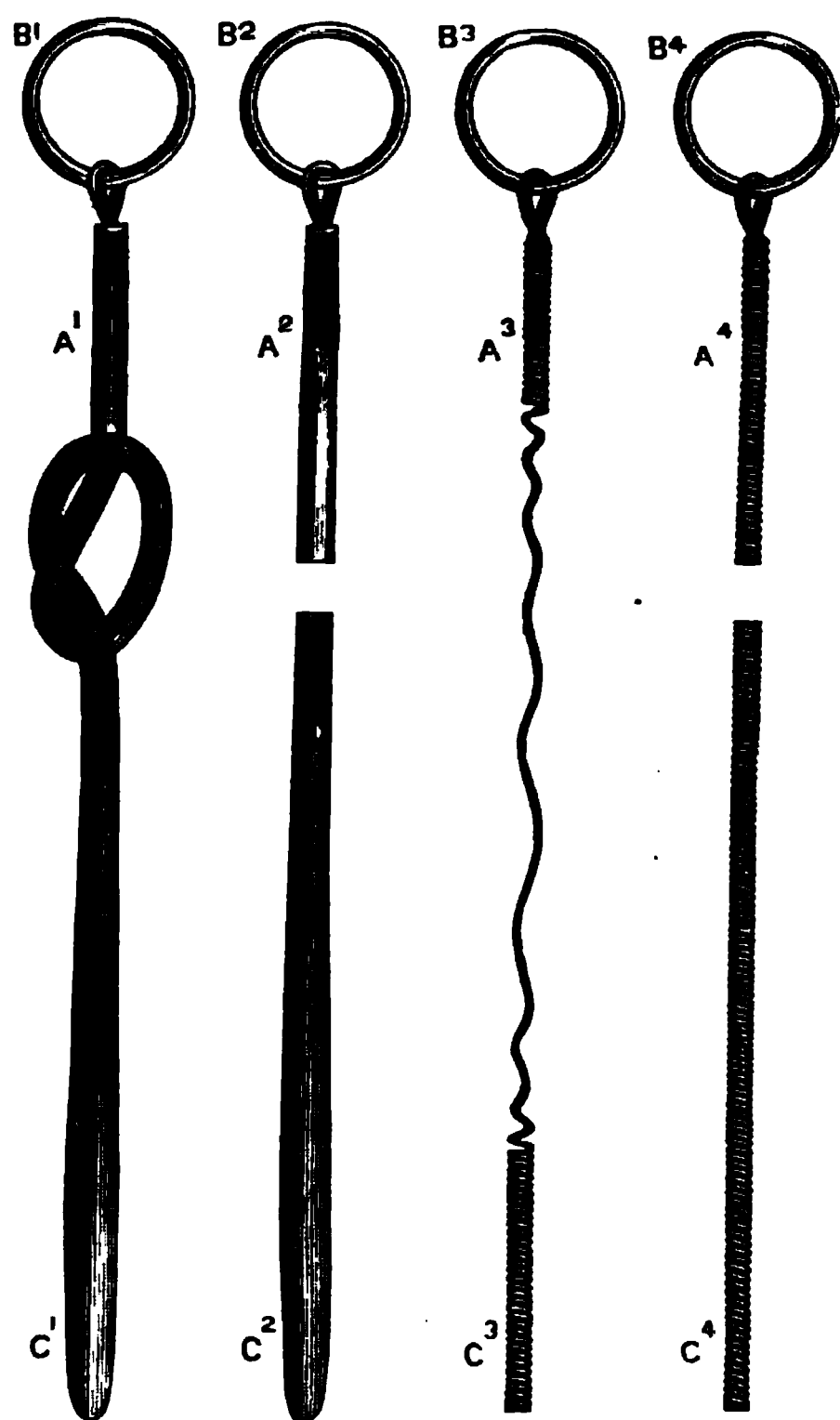


FIG. 1.—THE ANTROPHORE.
(*British Medical Journal*.)

tion upon its end causing it to uncoil (A³ C³) rather than to break. Its length is four, six, or eight inches. One end, C⁴, is now specially blunted, and to the other is attached a large ring, B⁴. This ring is valuable in preventing the bougie slipping bodily into the urethra out of the surgeon's or the patient's control. The spring next receives a coating of shellac in order to enable the medicament used to adhere to the wire. It is then dipped into a composition which consists of gelatin mixed with the drug to be used—such as thallin

sulphate, iodoform, tannic acid, sulphate of zinc, nitrate of silver (it was found that lead compounds and bismuth rapidly decompose; bougies of these drugs are, therefore, valueless), until the whorls of the coil become entirely coated. It is now suspended by its ring until the gelatine mass solidifies. Several dippings increase the thickness of the bougie to the required size (15 French gauge). The gelatine shrinks if the bougie is kept long; but this is not to its detriment.

“It will be noticed that suspension causes the composition to accumulate at the lower end, C²—in fact, just where it is generally most needed. When the bougie is nearly dry after its final dipping, it is sprinkled with powdered talc. The bougie is extremely pliant; it can be knotted like a Jacques catheter, A¹, and, like that instrument, it may be passed with ease and without discomfort. It is neither too hard before use nor too soft whilst in the canal, as its predecessor, the cacao-butter bougie, is. It is, moreover, long enough to reach the most important gleet section of the urethra, the deeper parts.

“These bougies have been well spoken of in the cure of gleet, especially those composed of 5 per cent. of thallin sulphate, by Drs. Krause, Nachtigal, Lohnstein, Bessard, and many medical men in this country. Most, however, agree that some cases are rendered worse by them, those in which the gleet depends upon a stricture, or localized patches of granular urethritis, or congestion. These latter cases require the incandescent-lamp urethroscope and some form of direct local treatment.

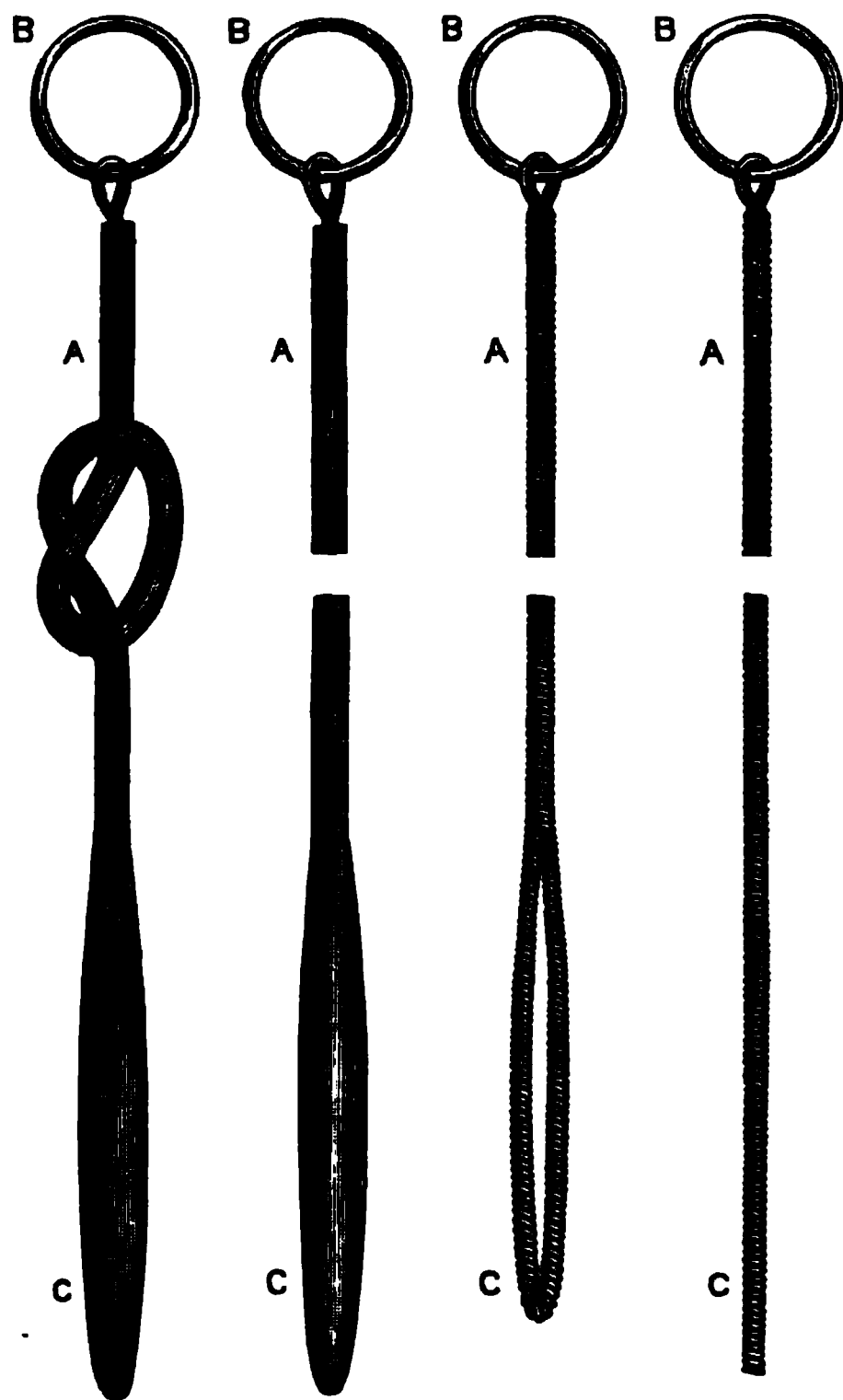


FIG. 2.—FENWICK'S MODIFICATION OF THE ANTHROPHORE FOR APPLICATIONS TO THE PROSTATIC CANAL.

(*British Medical Journal.*)

“ In order to localize the action of the medicament for cases of patchy congestion or ulceration of the urethra, and for topical applications to the prostatic canal, another form (which is represented in Fig. 2) has been made at the suggestion of Mr. Hurry Fenwick. It will be seen that this, the prostatic spring bougie (Fig. 2), is the same in principle and construction as the ordinary antrophore (Fig. 1), only that in the former the medicament is localized at the end, C, and that the remainder of the shaft is protected by a layer of pure gelatine, A. The shaft is six or eight inches long, and the bulbous end can be guided into, and located in, the prostatic canal by means of the finger in the rectum.”

Acute Gonorrhœa as a Cause of Pyæmia.—Roswell Park, of Buffalo,⁹⁹ reported at the meeting of the American Association of Genito-Urinary Surgeons in Washington in September a case of acute gonorrhœa in which the discharge ceased after about two weeks, to be followed shortly by swollen knees, sepsis, a typhoidal condition, and death. At the autopsy pus was found in the sternoclavicular articulation with erosion of bone, pus in other joints, enlarged mesenteric glands, etc. This appears to be the first case of its kind on record. Dr. Park was not certain that this was the patient's first attack of gonorrhœa, and was not acquainted with the condition of the deep urethra before the attack.

Gleet.—Hamonic²⁴ advances a new treatment for gleet. He has had constructed a special apparatus for the purpose of insufflating the urethra with the vapor of iodine, and claims that in this way “ in the most obstinate cases an average of eight insufflations has enabled me to obtain a cure.” He adduces eight cases in support. I have sent for the instrument, and at present can only say that this is important if true; but eight cases is a very small number to generalize from.

Stricture.—Fort has come out with a new method of treating urethral stricture by what he calls linear electrolysis. Professor Richet,¹⁰ presented Fort's views to the Paris Academy of Medicine, May 1st. After condemning internal urethrotomy upon the cited opinion of many authorities, Fort strongly advocates electrolysis as a safe, rapid, and comfortable method, claiming that relapse is rare. A history of the application of electricity to the cure of stricture is given, with a very extensive bibliography, commencing with Frommheld in 1860, mentioning Leroy d'Etiolle's allusions in

1852 to Wertheimer's ineffectual attempts in the same direction. Mallez and Tripier receive their share of attention, and their method is claimed to have cured many cases. The instrument of Jardin, of the clinic of Mallez, is the one brought out in this essay. It is like a *Maison neuve* urethrotome, except that the blade is a non-cutting plate of platinum. Four hundred operations performed with this instrument in different parts of South America are alluded to by the author. Fort's instrument is practically the same, except that it is in a single piece—not separable into parts. A number of cases of this linear electrolysis (it might better be called electro-cautery) are given. In one instance the maintenance of cure after one year is asserted upon the evidence of a letter from the patient. White foam is seen and a crackling sound heard as the platinum knife goes through the stricture. Some strictures, Fort says, require ten, others fifty, milliamperes for their division. In conclusion, he states that a sound must be



FIG. 3.—FORT'S ELECTRIC URETHROTOME.
(*Bulletin de l'Académie des Médecine.*)

passed from time to time if it becomes necessary, and he begs the entire point of radical cure by saying "this question of consecutive treatment remains to be studied." As for the Newman method, which is still, in this country at least, the burning question—if I may be pardoned the term—T. H. Burchard, of New York, ⁵⁰_{June 16} comes out in favor of it after tests upon twenty cases, three of which failed. He indorses Newman's views and approves the method for general efficacy and harmlessness, and for producing effects more enduring—in his opinion—than either dilatation or cutting. C. A. Bryce, of Richmond, Virginia, ²⁴⁵_{Sept.} also reports three cases in which he claims that organic stricture was radically cured by the employment of Newman's method of electrolysis.

A. Ady, of Muscatine, Iowa, ¹⁹_{Oct. 27} brings forward the first recorded case of death ascribed to the use of electrolysis in the urethra. The stricture was in the deep urethra, and the method of death was such as is encountered in pernicious urinary fever.

On the other side of the ocean Bruce Clark,²_{May 28} again indorses the method, and Swinford Edwards, of London,²²_{Apr. 11} is quite free in his praise of it. Edwards publishes a table of results obtained at the St. Peter's Hospital in London, twenty-four in all, of "Resilient or Non-Dilatable Stricture, Suitable for Either Internal or External Urethrotomy, Treated by Electrolysis." He claims: cured, two; improved, twelve; failed, three; improved under treatment, seven; and as improving under electrolysis combined with dilatation, four. His remarks abound in many of the indefinite expressions habitually made use of by those who advocate this method. The two cases stated to have been cured were verified at six and nine months respectively. The cases, although exhibited as a demonstration of the success of the method, read more like a series of greater or less successes by dilatation. Case one, alone, sounds like a cure, and that, from the history, might well have been urethral spasm.

On the other side of the picture for the year we have G. W. Allen, of Boston,⁹⁹_{Dec. 29, '87} who, after testing Newman's method in four cases, condemns it utterly. The rules were carefully attended to, but much disturbance followed in some of the cases and failure in all. John P. Bryson, of St. Louis,⁶⁵_{July} gives his opinion of three cases thoroughly tested by his assistant, E. C. Burnett, according to the Newman method. All were failures, and he condemns the method, imputing whatever advantage is ascribed to it to dilatation. J. B. Thomas, of Pittsburgh,⁶¹_{Aug. 11} also records a number of cases—all failures—and J. J. Buchanan, of Pittsburgh,⁶¹_{Sept.} adds another. J. Tilden Brown, of New York,²⁴⁵_{July} gives the whole subject a careful study from a literary stand-point, and reports some personal cases. He condemns the method absolutely in so far as its claim of radically curing organic urethral stricture is concerned, while allowing for it some probable merit in relieving urethral spasm—a merit which Newman denies it. He appends an extensive table of reported cases and a full bibliography.

My own experience with the method I¹_{Oct. 6} detailed fully before the Association of Genito-Urinary Surgeons, at Washington, in September. One case of spasm seemed to be relieved, as it might well have been, by dilatation. In every other instance, seven in all, failure was most absolute. Every rule laid down by Newman was followed as closely as possible, more closely than he himself

followed them in a case he kindly consented to treat and to cure for me as a practical demonstration of the success of the method. This case Dr. Newman had in his sole charge for about five months—more than twice the average two months in which he alleges that he has radically cured his two hundred reported cases. The patient visited him whenever he requested it, yet the failure in this case was the most brilliant, the most obvious, the most conspicuous of all. Of course, upon one case it is not proper to generalize, and upon it I say nothing, only presenting it as an offset to Newman's imputation upon the skill of others when he says, "Electrolysis cannot fail, operators can and do." In reply to his criticism that he did not have charge of the case for a long enough time, I have only to say that when he stopped treating the case he reported to me that a given stricture at four and one-half inches was cured, but that another one had appeared deeper, the other one having been described to my assistant by Newman as spasm, yet I found on examination the said four and one-half inch stricture still existing, not in as good a state as when Newman took charge, and in two months it had recontracted to an alarming extent. I never found any indication of the existence of spasm. So here the matter must rest for the year. My belief is that it is already judged by capable testimony and condemned; but, of course, many will still continue to use it.

Internal Urethrotomy.—F. N. Otis⁵⁹_{Sept. 22} reported at the Washington meeting of the American Association of Genito-Urinary Surgeons in September the total result of his seventeen years' experience in the treatment of stricture of the pendulous urethra by dilating urethrotomy, making the admirable showing of six hundred and sixty-six cases without a death.

F. Lange, of New York,¹_{Jan. 21} showed at the New York Surgical Society some knives constructed on the plan of the *Maison neuve* knife, which could be used in case of fistula or through a (surgically made) perineal opening. A filiform bougie could be passed through such an opening and out at the meatus; by this means a thread could be drawn out at the meatus, and by its means one of the knives cutting the stricture from behind forward. The device is novel, but it is hard to imagine a case in which the means already in use would not serve equally well, or better.

Best Method of Treating Organic Urethral Stricture.—Under

this head F. S. Watson⁹⁰_{Dec. 29} reaches the conclusion already accepted by many authorities, that anteriorly to the triangular ligament it is best to perform internal urethrotomy, behind this to dilate, if possible, otherwise to cut externally. Divulsion he condemns, and collates five hundred and ninety cases from various sources with very nearly 4 per cent. mortality. For internal urethrotomy he collates two thousand five hundred and forty cases (presumably in the entire urethra), with 2 per cent. mortality. For the anterior urethra better results are claimed, but not given statistically. For the deep urethra and external section he gives 8 per cent. mortality (Gregory, Horteloup)—or, sifted from errors, the operation not being at fault, 3 per cent.

To Find Proximal End of Urethra in Perineal Section Without a Guide.—Tillaux, of Paris,³_{Feb. 22} narrates a case in which he failed entirely to find the posterior end of the urethra after perineal section, and was obliged to open the bladder above the pubis and perform retrograde catheterism. Desprès, in the discussion, stated that in such cases he cut transversely a deep, broad section behind all morbid tissue in such a manner that the urethra must necessarily be cut across. Then, he says, the patient is made to urinate (how, it is not stated, if the patient is under ether) and the flow of urine demonstrates the position of the urethra. Le Fort suggested a means which he had used successfully in searching for vesico-vaginal fistula of small size. He makes the patient take a large dose of iodide of potassium; then he paints over the surface under search with the nitrate of lead. The spot from which a single drop of urine flows will discolor itself by a yellow precipitate of iodide of lead. Desprès' suggestion of transverse incision was criticised by Le Dentu, but the former maintained it on the ground that by its means he afterward resected the stricture. Le Fort objected to resection on the ground that it is improper to take away any portion of the tissue which surrounds the urethra.

Urethrectomy for Stricture.—Poncet, of Lyons,³_{Mar. 21} believes that the indication for urethrectomy is found in cases already previously operated upon and when fibrous periurethral induration exists in the perineum. In nine cases he had had no death or grave accident, and in three had obtained union by first intention. All the patients continued to use the sound after recovery, and after several months a No. 20 (F) sound could easily pass. He believes the

method superior to simple perineal urethrotomy, and states that the cicatricial linear scar left by primary union becomes "hardly retractile" after a few months. Cure by granulation naturally leaves a more retractile scar.

Transplantation of Mucous Membrane for the Radical Cure of Stricture.—Wölfler⁸⁴ described to the German Society of Surgeons three cases in which he employed Thiersch's method of transplanting epidermis for the radical cure of stricture. The cases were impermeable stricture which did not seem suitable for internal or external urethrotomy. The cicatricial area of the stricture of urethra was first carefully excised, and afterward the granulating surface was entirely covered with mucous membrane derived from a prolapsed uterus (of which there were two cases on hand). The membrane was kept in place by a packing of iodoform gauze, lubricated on its inner side with vaseline. (The method of bladder drainage is not mentioned.) Three or four days later the bandage was removed, showing a gray, sticky mass where the mucous membrane had been placed. Three or four days later the granulating area seemed covered as with a veil, and again after four or five days the surface was smooth and shining, like true mucous membrane. One of the patients was seen after a year, having had no intermediate treatment. He urinated in a thick stream. The second did as well, but the observation had not lasted as long. The third died six months after his operation from double nephritis. Autopsy demonstrated a continuous mucous membrane. The boundary between the old and the new mucous membranes could not be clearly determined.

E. Meusel, of Gotha,⁴ acted in a similar manner except that the transplantation was made upon the fresh surface. After excising a perineal stricture he transplanted with great care a piece of the patient's inner layer of the prepuce, twelve square centimetres in size, five centimetres long, and two and a half wide. Four catgut sutures were placed at each end of the transplanted piece and a woven catheter tied in; on the third day the dressing was changed, and on the fifth day thorough inspection showed that the flap had taken. A small fistula still remained at the date of the report. Bardenheuer has used the same method, as stated in a letter to Meusel.

Urethro-Rectal Fistula.—Every one who has struggled with

a fistula between the rectum and the urethra will read with satisfaction the successful result accomplished in such a case by Wyeth, of New York.²⁵⁷ The stricture was a large one, involving the entire floor of the urethra. I cannot more concisely describe the operation than by reproducing Wyeth's words:—

“The patient, in ether narcosis, was placed in the Sims position, and a large Sims vaginal speculum was introduced. The opening through the anterior wall of the rectum measured three-fourths of an inch in length, with an irregular width of from one-eighth to one-fourth of an inch. It led directly into the urethra near the junction of the membranous and prostatic portions. The floor of the urethra was entirely destroyed. The right edge

(patient's right) of the opening was seen to be undermined, as shown by the dotted surface, B, in Fig 4.

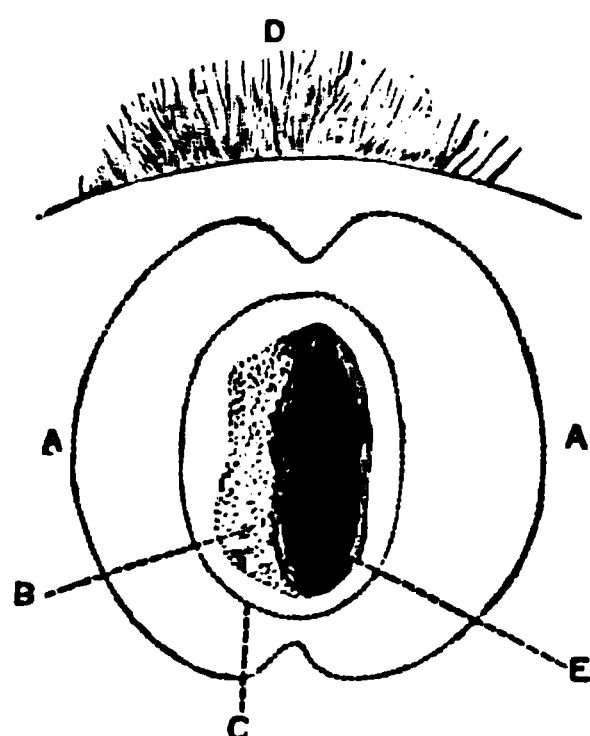


FIG. 4.—WYETH'S OPERATION
FOR URETHRO-RECTAL FISTULA.
(*Canada Lancet.*)

“I determined to attempt the formation of a new floor to the urethra by turning the mucous membrane of the rectum into this position. Two crescentic incisions were made, as shown at A, A, Fig. 4, being about parallel with the edges of the opening, but approaching more closely at its upper and lower angles. These incisions went deep into the wall of the rectum and included the mucous and muscular layers. The two

lateral flaps were dissected up the left to within an eighth of an inch of the edge of the opening; the right could not be carried so far on account of the pocket which undermined this side.

“The flaps were now turned toward each other and their raw edges made to meet in the middle line, while the raw surfaces looked into the rectum, and the mucous surfaces into the urethra. Sutures of silk-worm gut were inserted. These sutures were about three-sixteenths of an inch apart, and were so inserted that they did not penetrate to the cavity of the urethra. On account of the thinness of the flap at one point, I was compelled to pass one suture into the urethra.

“A Nélaton catheter was carried through the meatus and urethra into the bladder, and through this the urine ran out at

intervals. Whenever the urine accumulated enough to create a desire to expel it, about six ounces of Thiersch's solution were thrown in to dilute it, and when this, with the normal contents of the bladder, were evacuated, the same quantity was thrown in again and immediately expelled. In this way the wound was kept practically free from irritation by the urine. Divulsion of the sphincter and removed all danger or annoyance from spasm of this organ. The bowels were kept quiet for nine days, and liquid diet was enforced. The patient had been placed on liquid diet for ten days prior to the operation.

"The sutures were left *in situ*. The wound healed promptly and the patient left for his home in three weeks after the operation. In April, 1888, seven months later, he returned complaining of slight irritation in the rectum, and said he thought at rare intervals a few drops of water escaped into the bowel. On examination three of the sutures were still in position, but no opening could by most careful search be discovered.

The sutures were removed and in a few days the patient was discharged."

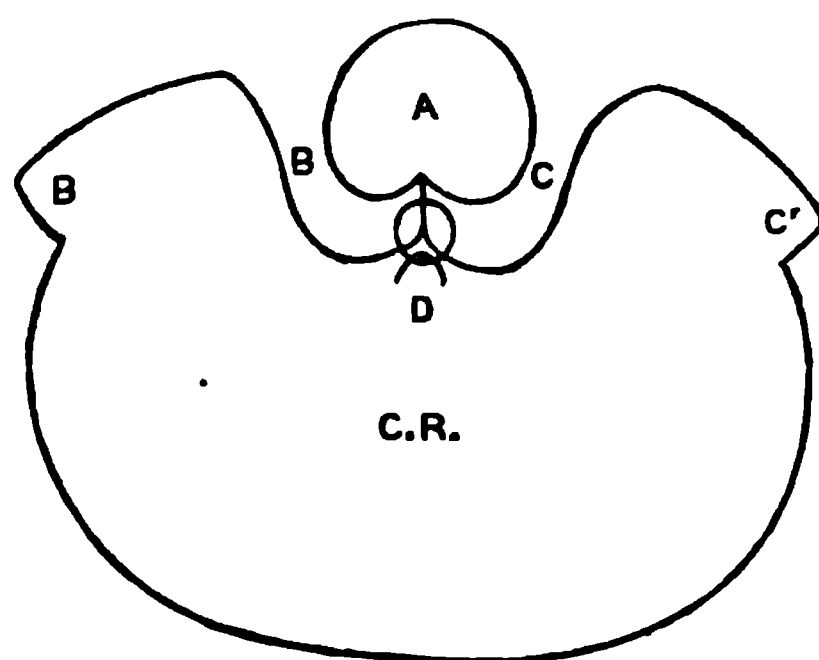


FIG. 5.—TRANSVERSE SECTION THROUGH THE URETHRA AND RECTUM, SHOWING THE METHOD BY WHICH THE FLAPS WERE TURNED FROM THE MUCOUS MEMBRANE OF THE RECTUM TO MAKE THE FLOOR OF THE URETHRA. (SCHEMATIC.)

A, urethra; B, the right flap dissected from B; C, the left flap from C'; D, the silk-worm-gut suture in position (not entering the cavity of the urethra).

(Canada Lancet.)

RUPTURE OF THE URETHRA.

Socin, of Basel, ²¹⁴_{Aug. 1} records two cases of traumatic rupture of the bulbous urethra treated by immediate suture. The canals remained normally permeable. In one a difficulty in urination persisted for some time, and on endoscopic examination a thread suture was discovered and extracted with satisfactory result. In a third patient, aged eleven, both the urethra and the external wound were closed. The ultimate result was stricture. A year later Socin excised the stenosed portion and applied circular suture. At the date of report no stricture remained. Paoli Erasme, of Turin, ²⁶⁶_{Mar.} also reports a successful case of immediate suture of the urethra after rupture, with entire cicatrization on the nineteenth day, and W. L. Woolcombe ⁶_{Nov. 10} gives a case where catgut

suture was applied, following perineal section, for traumatic rupture of the urethra, silver sutures superficially. A catheter was tied in for ten days; no leakage after ten days. W. A. Garrard, of Sheffield,⁶ contributes the case of a man who fell upon a piece of iron, completely severing the urethra in the perineum, and tearing part of it away. The proximal end was found, and when a webbed catheter had been passed into the bladder the severed urethral ends were noted as being two inches apart. They were brought together, and the ends sutured with silk. The urethra united in a week. This is equivalent to excising stricture and suturing the ends of the urethra.

DISEASES OF THE PROSTATE.

Prostatectomy.—A. F. McGill, of Leeds,⁶ after commenting on the well-known fact that the amount of trouble caused functionally by an enlarged prostate is not due to size, but to the position of the enlargement, calls attention to one form not generally noted and first described by Sir Benjamin Brodie, namely, a “uniform circular projection surrounding the internal orifice of the urethra.” McGill asserts that this may frequently be clearly observed through a suprapubic wound, and he believes it to be the commonest form of obstructive prostatic disease. The hard, collar-like mass may be felt by the finger introduced through a suprapubic wound (and, indeed, seen) projecting for a variable distance into the bladder. When the bladder is removed from the body this appearance is lost, thus accounting for an absence of a description of this common lesion from text-books. It was seen in four out of the five last cases operated upon at the Leeds Infirmary. Sessile and pedunculated median enlargements are the other forms of obstructive prostatic hypertrophy.

To remove this collar after opening the bladder above, McGill advises the insertion of one blade of a scissors into the urethral opening of the prostate from within the bladder, and that the collar be split above, repeating the splitting below, and then with scissors curved on the flat the removal of each portion thoroughly, leaving nothing of the projection behind and being certain that the urethra is freely patulous by inserting the index finger well into the prostatic sinus. Hæmorrhage is slight and may be arrested by hot antiseptic solutions. The bladder is drained

by a tube from above, its walls being partly closed. McGill has operated on three cases, all of which had to resort to constant catheterism before the operation. In two the urine was purulent and alkaline, in one uræmia and surgical kidney were said to be present. All recovered quickly and left the hospital urinating freely without the catheter. Two had preserved their recovery eight months, up to the date of the last observation. There was no functional evidence of cicatricial contraction of the vesical orifice, which McGill explains by presuming that the character of the wound makes a scar which draws the mucous membrane outward and thus possibly enlarges rather than diminishes the urethral orifice.

Electrolysis for Radical Cure of Prostatic Hypertrophy.—Leopold Casper, of Berlin,⁴ has made efforts to cure enlarged prostate radically by the action of the electric current. He mentions the previous work of Nélaton and Althaus in this direction and some experimental work upon the prostates of dogs. He employs a platinum-iridium needle, insulated. The patient lies upon the side, the rectum being distended with one hundred grammes (three ounces) of a one in one thousand sublimate solution. The positive pole, a flat plate four hundred square centimetres, moistened, is bound upon the abdomen. Then, protected by an oiled finger, the insulated needle is inserted through the anus and plunged into the prostate, and the negative pole attached. For five minutes from ten to twenty-five milliamperes of current are allowed to pass. Then the needle is partly withdrawn, but not entirely removed from the prostate, and it is re-introduced in another direction, held for five minutes with the same quantity of current, and again in another direction for another five minutes. After the current reaches twelve milliamperes, a light burning or pricking of the glans penis is complained of.

Four cases are given: Case I. Sixty-one years old; chronic cystitis, general hypertrophy; one hundred and fifty cubic centimetres residual urine; accustomed to use catheter once a day. Twelve sittings. It is stated that there was improvement, but certainly not a cure. Case II. Sixty-two years; retention, general hypertrophy. Seven sittings. Result, vesico-rectal fistula from defective insulation. Case III. Sixty-three years; retention, general hypertrophy. Fifteen sittings. No improvement. Case IV. Sixty years. Ten sittings, and some improvement claimed.

In the same line Roux¹⁹⁷_{May 20} claims by the employment of electrolysis to have reduced the size of the prostate in four patients. Two others had only had one sitting each. He says very little about improvement of function, but states generally that in one case it was satisfactory. Altogether the outlook for electrolysis seems as unpromising for the prostate as it has proved to be for the urethra in the treatment of stricture. Robert Newman, of New York, naturally appears in this line with his galvano-cautery sound for the radical treatment of prostatic hypertrophy. The paper was read September 8, 1887, before the International Medical Congress, in Washington, but a reprint appears this year.⁴⁶² As the matter was mentioned in the 1888 issue of the ANNUAL (vol. ii, p. 21), no further mention seems called for, especially as nothing new has been reported from the instrument during the current year.

DISEASES OF THE BLADDER.

Cystitis.—James¹⁰⁹_{Apr.} praises greatly, both in acute and chronic cystitis, in old gleet and in prostatic troubles, the injection of the bladder without catheter, by gravity, the injecting-bag being elevated about six feet above the bladder, the patient squatting with the knees widely apart, the following mixture:—

R Quiniæ sulph., 3 1 (2 grammes);
 Mucilaginis, 3 4 (124 grammes);
 Aquæ tepid, q.s. ad 0 2 (1000 grammes)—M. ;

adding morphine or cocaine when there is much tenesmus. The patient voids the injected fluid as in urination.

Vesical Irrigation Without Catheter.—Lavaux, of Paris,¹⁰⁰_{Sept. 18} again describes in detail and dilates upon the value of his siphon apparatus, first described in 1887,³⁶⁰_{Mar., May} for the treatment of cystitis and catarrhal troubles of the deep urethra in the male. He finds that a pressure of 1.30 metres (about five feet), and a nozzle with a calibre one and one-third millimetres in diameter, can by simple pressure of the water at that elevation inject the bladder through the urethra without the use of the catheter, if the patient be lying down and the nozzle held firmly in the urethral meatus. He declares that such irrigations can do no harm, and very often effect a cure, being better than the means in ordinary use. He occasionally uses a larger cannula—up to three millimetres in diameter. He stops vesical distention on the first perception on the part

of the patient of a desire to urinate. He believes the method free from danger; but that this is not absolutely true must be admitted from the testimony of E. Desnos,^{17 Feb.} who furnishes several cases, female as well as male, in which this method of Lavaux, tested with all possible care, produced a rather intense cystitis. I have tried it a number of times without disadvantage, but without deriving from it any very good results. Lavaux uses a boracic acid solution. I believe it is the one prepared by the process of Scholtz, or much like it, which is commented on^{266 Feb.} by Mansier. It seems that magnesia (calcined), like many other alkaline substances, makes it possible for water to take up much more than the customary 4 per cent. of boracic acid into solution. It is stated that one gramme (fifteen grains) of calcined magnesia will cause seventy-five grammes (two and one-half ounces) of boiling distilled water to take up twelve grammes (three drachms) of boracic acid. This Mansier denies, but he claims that 1 per cent. of magnesia will dissolve in one hundred parts of boiling distilled water 12 per cent. of boracic acid, and that the solution will remain clear when cold. I have had this tried by a competent chemist, and find it to be a fact. The solution must be filtered, and even then, when cold, precipitates very slightly. The solution seems to be a polyborate of magnesium. It is alkaline, and when added to urine immediately precipitates in a white, granular, fine sediment. There is, of course, considerable free boracic acid in the fluid (my chemist thinks as much as 10 per cent.). Whether this solution is any better than the ordinary saturated, hot, pure boracic acid solution, which does not precipitate upon contact with urine, I do not know. Guyon, in his hospital work, is said to use a boracic acid in water containing 10 per cent. of borax, which is seemingly equivalent to the magnesian solution, and perhaps better.

Arnold, of Stuttgart,^{116 July} gives excellent testimony as to the value of salol in vesical catarrh. He used forty-five grains a day in the case of an old man of eighty with vesical paralysis and ammoniacal purulent urine. The dose, which did not disturb the stomach, cleared and sweetened the urine. Its withdrawal on two occasions allowed the urine again to exhibit alkaline fermentation and to become turbid, but it again cleared and became acid when the drug was resumed.

Tubercular Cystitis.—Guyon,^{91 Apr. 10} at the Congress of French

Surgeons, detailed two cases of tubercular cystitis, confined to the bladder. In the first, a man of twenty, who had had cystitis for a year with atrocious paroxysms of pain, that morphine only partially relieved, the urine containing the tubercle bacilli, he cut above the pubis, dilated the neck of the bladder from within, with the finger, and painted the bladder with iodoformed oil. Two and a half years later perfect health, no bacilli in the urine. In case two, a man of forty with painful cystitis and urine full of bacilli, he also did the high operation, scraped the bladder freely, and touched it with a point of thermo-cautery. There resulted great improvement but not a positive cure. The bacilli disappeared.

STONE IN THE BLADDER.

Charles Williams, of Norwich, England,¹ contributes an interesting and suggestive article, delivered before the American Association of Genito-Urinary Surgeons at Washington in September, concerning the greater relative elimination of uric acid in cases of enlarged spleen, and a history of a large stone of this material which rapidly formed in a patient under these circumstances. He also touched upon the question of the propriety of dealing with such cases by a cutting operation, in view of the tendency to hæmorrhage, which in individuals having enlarged spleen is known to be often very great.

The curious fact that a religious rite is sometimes the remote cause of stone in the bladder is vouched for by W. H. Curtis,⁵⁸ of Peking, who states that the followers of the Travist religion in China (B. C. Atterbury²³⁵ vouches for this same fact) are accustomed to introduce a piece of ivory chop-stick, about two and a half inches long, into the urethra at night and to leave it there for the purpose of "keeping the paths of life open." A stone had been removed on two occasions with such a nucleus from individuals who reluctantly confessed the practice. One of the sticks is said to have been in the bladder twenty years.

Litholapaxy.—Surgeon-Major P. J. Freyer,² whose previous report on litholapaxy in 1886 brought his record of stone operations up to the end of 1885, records his last one hundred cases of operations in the Bengal medical service—namely, from January 1, 1886, to August 5, 1887—all of which ended in recovery.

There were :—

Litholapaxies in male adults,	.	.	.	.	.	.	61
“ “ children,	.	.	.	.	.	.	16
Lithotomies “ “	.	.	.	.	.	.	22
Suprapubic cystotomy in male,	.	.	.	.	.	.	1
							<hr/> 100

He uses for litholapaxy a lithotrite upon the Bigelow model, except that the female blade is completely fenestrated, an improvement upon the efficacy of which he insists very properly. The largest tube he employed in any operation was eighteen English—the smallest eight—which was used, among others, in a child three and a half years old. The heaviest stone, weighing two ounces four drachms, was uric acid.

The lithotrite was introduced seven times, the time required was forty-five minutes, and the patient remained in the hospital ten days. He was thirty years old. One patient was eighty-two years old, three were seventy, and one was three and a half. All recovered.

Statistics of Five Hundred and Fourteen Operations for Stone.—Dittel, ⁸¹_{Feb. 4 to Mar. 17} of Vienna, gives the report of his fifty last operations upon stone cases, his total being five hundred and fourteen :—

	Number.	Cured.	Imp'vd.	Died.	Mortality.
Lithotripsy	178	148	7	23	12.92 per cent.
Litholapaxy	192	179	1	12	6.25 “
Lateral operation . . .	65	39	1	25	38.46 “
Median “	40	20	1	19	47.5 “
Suprapubic “	26	13	1	12	46.15 “
Urethrotomy	1	..	1		
Extraction	9	8	..	1	
Spontaneous passage .	3	1	2		

Excluding spontaneous passage, therefore, the total is : Cases, five hundred and eleven ; died, ninety-two ; total mortality, 17.99 per cent.

Actually the percentage of mortality is a little greater, because the five hundred and fourteen operations were performed upon five hundred patients, some of them being cut after having submitted to a previous crushing.

A second table compares the results of lithotripsy and litholapaxy, dividing the patients into five groups according to age :—

Age.	Treatment.	No. Cases.	Cured.	Died.	Average Duration of Treatment in Days.	Mortality.
1-15	{ Lithotripsy . .	4	4		16	
	{ Litholapaxy . .	3	3		20	
16-30	{ Lithotripsy . .	13	12	1	24	7.69
	{ Litholapaxy . .	6	6	..	13	
31-50	{ Lithotripsy . .	29	27	2	31	6.83
	{ Litholapaxy . .	23	22	1	13	4.35
51-64	{ Lithotripsy . .	77	65	11	38	14.
	{ Litholapaxy . .	87	83	4	15	4.6
65-87	{ Lithotripsy . .	38	29	8	37	21.05
	{ Litholapaxy . .	72	65	7	15	9.72

This table shows the decided advantage of litholapaxy over lithotripsy, both in general mortality and in length of time required for treatment.

A final table of his statistics shows that in sixty-five lateral operations for stone the mortality mounts with the age from 15 per cent. between the ages of one and fifteen up to 50 per cent. between sixty-five and eighty-seven.

The median operation gives, on the other hand, a decreasing mortality with increasing age—forty cases in all, with mortality 80 per cent. from the ages of one to fifteen, steadily decreasing to 25 per cent. between the ages of sixty-five and eighty-seven.

For the suprapubic operation the mortality again increases with age—twenty-six cases, mortality 33.33 per cent. between the ages of one and thirty, 66.66 per cent. between fifty-one and sixty-four, and a fall of 50 per cent. between sixty-five and eighty-seven. The last fifty cases of the five hundred are given in detail in a special table.

Otis K. Newell, of Harvard, ⁹⁹May 10 in a profusely illustrated study of the question, argues that urethral instruments, as ordinarily constructed, are unnecessarily long, and that, by crowding down the pendulous urethra upon itself, a length of six inches is ample for any instrument in any ordinary case. He has applied this principle to the construction of a modified Bigelow evacuator, making the tube short, the receiver large, and the couplings of hard rubber. In this way he claims to produce an efficient evacuator weighing less than one-half the standard Bigelow instru-

ment. Time must decide what, if any, advantage this evacuator possesses over its forerunner.

Litholapaxy in Male Children.—D. P. Allen⁹ reports four successful cases of what he terms successful litholapaxy in male children, being apparently the first of the kind in this country. The one circumstance, however, that detracts from their merit is, that the children were really almost young men, being aged, respectively, thirteen, thirteen and a half, fifteen, and nineteen years.

H. H. Clutton,⁶ contributes a successful litholapaxy upon a male infant of three years, in St. Thomas' Hospital, London, using No. 5 English lithotrite and No. 9 English cannula.

E. Hurry Fenwick, of London,²⁶ also reports a successful



FIG. 8.—NEWELL'S MODIFICATION OF BIGELOW EVACUATOR.
(*Boston Medical and Surgical Journal.*)

case of litholapaxy upon a male child, aged nine, and has collected from all sources one hundred and six cases, thus tabulated:—

Between 1 and 2 years.	.	.	6 cases.	No deaths.
" 2½ "	3	"	10 "	"
" 3½ "	4	"	13 "	One death.
At 5	"	"	16 "	No deaths.
Between 6	"	9	34 "	"
" 10	"	15	27 "	"

106 cases. Mortality, 0.9 per cent.

This showing is admirable, and the article is most interesting in showing how very applicable the operation is to boys. Keegan is quoted as saying: "I would almost as soon think of performing lateral lithotomy on an old man, the subject of a small uncomplicated stone, as I would think of performing lateral lithotomy upon

a boy whose urethra readily admitted the passage of suitable lithotrites and evacuating catheters, and whose stone was neither abnormally hard nor large."

Surgeon-Major D. F. Keegan, of Indore,²⁰⁸ records, with table, one hundred and fourteen litholapaxies in young boys, done at the Indian Hospital by himself, Surgeon-Major Caldecott, and Mr. Gunputsingh, with four deaths in all,—certainly an excellent showing, as most of the children were very young and some of the stones quite large.

MISCELLANEOUS OPERATIONS.

Laparotomy with Suture for Intraperitoneal Rupture of the Bladder.—Grant, of Louisville,⁶¹ reports a case of intraperitoneal rupture, laparotomy, and suture with fatal result. He cites the other cases reported thus far, omitting, however, the pioneer successful case, that of Hofmokl, of Vienna, and overlooking Walsham's successful case (March, 1887, St. Bartholomew's Hospital). Of the fourteen cases collected by Grant, nine died. These, with Hofmokl's and Walsham's successful cases, make sixteen operations and nine deaths. Since Grant's report there have appeared two—one by J. Z. Brown, Henderson, Ky.,⁵⁹ fatal, and one by W. H. Brown, of Maffra, Victoria,⁶ also fatal; making sixteen cases and eleven deaths,—a showing which is not so very bad, considering the gravity of the condition calling for operation.

Closure of Wound after the High Operation.—One of the new suggestions for application in closing the wound after the high operation which appear in several different articles this year is Brenner's "*schürnaht*," or lace suture, which that surgeon²²⁶ introduced for vesical application, experimenting upon animals, six in number, and found satisfactory. This suture is essentially the same as was formerly advocated for certain urethral fistulæ by Dieffenbach. As applied to the bladder-wound, the mucous and muscular coats are separated, and a thread is passed around the wound in the submucous tissue, two or three millimetres from its border. A second thread is then passed around the wound, going through the muscular layer, three and a half millimetres from the cut edge, being a little farther removed from the wound at its angles. The sutures are finally drawn down and sutured in the order of their introduction, thus puckering the walls of the bladder

into a dense mass at the injured point. This suture is especially advocated when the walls of the bladder are thin.

Four new methods of opening the bladder have come to the surface, surgeons being particularly active in devising new means to obtain either more room or better drainage:—

Langenbuch's Subpubic Cystotomy.—This new operation has been thus far performed only on the cadaver. It is described by Hirschwald, of Berlin,³³⁶_{No. 27} and cannot give as much room as the ordinary high operation, unless at the same time the pubic symphysis is resected. An incision is made over the pubic symphysis straight down to the root of the penis, and continued in two lateral branches, one on either side of the penis. The suspensory ligament of the penis is divided, the veins avoided, and the bladder opened. Drainage is effected by punching a path for a drainage tube alongside the penis and out through the integument of the perineum. The operation does not appear to present advantages worthy of commending it for any general experimentation.

Intraperitoneal High Section.—Rydygier, of Krakau,⁸⁴_{Apr. 14, 21} gives a long and learned discussion on the history of the high operation with a copious citation of authorities and a discussion of methods—open and by drainage with sutured vesical walls—and, finally, he advocates an intraperitoneal method, and details a case operated upon by himself. He did this on account of a desire to avail himself of the plastic qualities of the peritoneum for obtaining speedy union. . He employed a double row of silk sutures. The patient was a boy of thirteen, and was operated upon December 5, 1887. After the peritoneum had been sutured a catheter was retained in the bladder by being sutured to the prepuce. The abdominal wound was dressed on the twelfth day and found healed. The catheter was removed from the bladder on the same day. The stone removed was as large as a hen's egg, composed of basic phosphate of lime and uric acid. The patient later passed a few small stones which came down from the left kidney. He went from the hospital well in April.

Osteoplastic Temporary Resection of the Anterior (Lateral) Portion of the Pelvis for the Purpose of Extraperitoneal Exposure of the Bladder and its Neighborhood.—This novelty in vesical surgery has been practiced a number of times upon the cadaver and once upon the living subject (with comparative success) by

P. Niehans, of Berne, ³³⁰_{July 21} who details the method with illustrative plates. This method may come into use in exceptional cases (like the one operated on for vesico-intestinal fistula, or possibly for the total extirpation of the bladder), but it is far too severe for ordinary cases. In the same direction, Helferich, of Greifswald, ⁴¹_{Apr. 18} as stated at the German Surgical Congress, has resected the pubic bones three times, König once, Rosenbach once, Trendelenburg twice.

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FIGS. 7 AND 8.—BROWNE'S APPARATUS FOR FUNCTIONAL RELIEF OF THE BLADDER.
(*British Medical Journal*.)

The functions of the pelvis do not seem to be mechanically injured by the operation.

Apparatus for Permanent Suprapubic Drainage.—Figures 7 and 8, which explain themselves, represent an apparatus used successfully for several months by G. Buckston Browne, of London, ²_{Aug. 1} on a patient with vesical cancer upon whom he operated by the suprapubic method for functional relief of the bladder. Mr. Browne

states that one of Sir Henry Thompson's patients is now wearing the apparatus with relief and comfort.

Capacity and Tension of the Bladder.—L. Duchastelet, of Paris,³⁴⁵ in a very able and extended essay, which received the Godard prize in 1887, makes a thorough study of this subject, the capacity of the bladder being measured by the quantity of fluid it is capable of containing at the moment when a desire to urinate is perceived. His study, among other matters, takes in experiments upon the dead as well as the quick, and includes conditions of disease as well as health, and the variations produced by all sorts of influences. The one hundred and sixteen pages do not allow any suitable condensation or any practical deduction that I think would be of value here. The subject is treated in the most minute detail.

The Cystoscope.—Willy Meyer, of New York,¹_{Apr. 21}; Heycock, of St. Peter's Hospital, London; Otis, of New York; E. H. Fenwick, London,²_{Feb.}; and several others sing the praises of the cystoscope, but the year seems to have produced nothing essentially new regarding the instrument, and much less than usual is heard of it from German sources. G. Rivière revives the history of the mégaloscope of Boisseau du Rocher, which was shown to the Academy of Medicine at Paris in 1885, and used for inspecting the bladder, the stomach, and other cavities of the body. Its optical arrangement enlarges the field of vision, and a claim seems to be implied that it is better than the instruments of Nitze or of Leiter, although this is not expressed in so many words.

Exstrophy.—Exstrophy of the bladder receives very extended and admirable review from the pen of A. Pousson, of Paris,²⁶⁸_{Feb., Sept.} in an extended article.

Formation of a New Bladder.—Tizzoni and Poggi, of Bologna,⁶_{Nov. 10} have operated upon an animal to form a new bladder as follows, in two stages: First, a portion of intestine was cut out, except that the mesentery was left attached to the divided portion. The continuity of the divided intestine was re-established by immediately suturing its divided ends. The excised portion was now closed at each end, brought down, and fixed to the neck of the bladder. A month later the bladder was excised, the end of the intestine excised, the pouch sutured into position, and the ureters grafted upon the posterior wall of the newly-formed bladder. For

a few days there was incontinence of urine, but in a fortnight the sphincter regained its power and the animal completely recovered. The bladder proved too small, so that urination was very frequent. The operators propose to try again, excising a larger portion of gut.

TUMORS OF THE BLADDER.

E. Hurry Fenwick,²_{Sept. 22} reports the rather novel operation of first diagnosing the position in the bladder (with the cystoscope) of a small pedunculated growth and then with a large litholapaxy tube and washing bottle, after several efforts, successfully sucking it into the eye of the tube and removing it. He states that the part taken away was a "necrotic growth and blood-clot."

A very full and seemingly thorough essay of a critical sort upon the operative methods for removing vesical, prostatic, and vesico-prostatic tumors by perineal and hypogastric methods has appeared from the pen of Ch. Jacobs.²⁷⁶_{Apr. 5 to July 20} F. A. Southam,²_{June 1} of Manchester, England, furnishes an interesting article upon sarcoma of the bladder, a rather uncommon form of vesical tumor, based upon a collection of thirty-four cases. More than the usual number of contributions upon vesical tumors have appeared during the year, touching their nature, removal, the use of the cystoscope, etc. Among them may be mentioned a case of sarcoma by Vincent Jackson, London,⁶_{May 19} and epithelioma by Thiery,⁷_{Nov. 12}; the beneficial effects of preliminary drainage, in connection with certain cases of vesical tumor, by F. A. Southam, of Manchester,⁶_{May 20}; encephaloid tumor of the bladder,⁷⁰⁸_{Apr. 15} ²⁸⁸_{May 20}; an article by Zinsmeister,⁵⁷_{July 29}; villous tumors, by Ward, of Leeds,⁶_{Sept. 1}; articles by Otis, of New York,⁵⁹_{May 6}; Watson, of Boston,⁹⁹_{Aug. 16}; Burling, of Birmingham,²_{July 7}; W. Meyer, of New York,⁵⁹_{July 7}; fifteen cases of vesical tumor, with illustrations of the visual field of his cystoscope and a new description of the instrument, by Max Nitze, of Berlin,⁶_{Apr. 21}; a general lecture by Sir Henry Thompson,²_{Jan. 7, 14} and several others.

Professor Antal, of Vienna,²_{Mar. 24} removed early in 1887 a papilloma by the high operation. Later, hæmaturia again appeared with shreds of tissue in the urine. The cystoscope revealed a new tumor near the neck of the bladder, the site of the old one being marked by the presence of a white scar, which tumor was removed by several operations through the urethra with

long, straight forceps. Antal tore away the new fimbriated papilloma and cured the patient, verifying the fact with the cystoscope. The method is novel.

Peterson's Rectal Colpeurynter.—A new case of death due to this instrument is reported by Nicaise,³_{Oct. 10} due to rupture of the anterior rectal wall. The bladder was distended with two hundred and seventy grammes (eight and a half ounces), the rectal balloon with three hundred and forty (ten and a half ounces). This is the fourth or fifth case of death from this instrument reported in France.

Albert B. Strong, of Chicago,⁹⁶_{July} in an excellent and most interesting anatomical study, with plates, shows the great advantage of rectal inflation in rolling back the peritoneum over what occurs when the bladder alone is distended, the rectum remaining empty. This is another important contribution to the subject, especially as it is well known that Guyon claims that the rectal distention does not roll back the peritoneum, but simply raises and fixes the bladder, putting it into a position suitable for operation.

Catheterization of the Ureter in the Male Through the Suprapubic Vesical Opening.—Axel Iversen³³⁶_{Apr. 21} reports such a case, a man of thirty-eight. By this means he demonstrated that the right kidney yielded clear urine while the supply from the left contained pus, blood, etc.

STATISTICS.

As a contribution to the statistics of the high operation, great value attaches to the report of Edmund Assendelft, of Wetoschkino, in Russia.²²⁶_{Jan. 1898} He records one hundred and two operations with only two deaths, one of which was in a boy of four with marasmus, follicular ulceration of the intestines, and bronchitis—conditions not due to the operation—thus making his real mortality about 1 per cent.

DISEASES OF SPERMATIC CORD AND EPIDIDYMIS.

Suppuration in the Cord.—H. H. Johnson, of Belfast, Maine,⁹⁹_{May} reports a general inflammation of the spermatic cord mistaken for hernia and treated at first with a truss. He found a hard swelling extending from midway between the anterior superior spinous process of the ilium to the pubis down to the testicle. He removed the testicle and the cord. The latter measured seven inches in circumference and was well advanced toward suppuration. Recovery was uninterrupted.

Ségon¹⁵² contributes a case of suppurating cyst high up in the right spermatic cord, which had been mistaken for hernia. Puncture yielded a glass of pus and cure followed the operation.

Spermatocele.—Vautrin, of Nancy,⁷⁸ reports a case of spermatocele high up upon the cord, not connected with the epididymis. He believes the cause to be obliteration of the communication of one of the vasa aberrantia (remains of Wolffian body) with the deferent canal, and that such shut off portion may remain as an isolated cyst entirely outside of the tunica vaginalis, high up on the cord, disconnected with the vas deferens, and containing the remains of spermatozoa cases. He cites two analogous cases, one from Laugier¹⁰⁹⁰ and one of Alide de Brunswick,¹⁰⁹¹ the latter being a doubtful case.

Sarcoma of the Cord.—Such a tumor, as large as a pigeon's egg, situated high, was removed successfully¹⁸⁸ by Demons.

Paquelin Cautey in Epididymitis.—Geo. E. Brewer, of New York,²⁴⁵ refers to this method of treatment for the relief of pain in the epididymitis. It was first introduced by W. S. Halstead, of New York. Brewer thinks very well of it. The little operation requires only a few seconds for its performance. Out of forty-six instances in which he has used it only two patients have been obliged to remain in bed after the first application, and in one of these the real cause for confinement was co-existing cystitis. The operation is simply a light touching of the surface of the skin overlying the testicle with a white-hot cautey point and afterward applying iodoform ointment and a suspensory bandage. He thinks the sixty grains (four grammes) to the ounce solution of nitrate of silver (Jordan's method) also a good counter-irritant but objectionable from the fact that it frequently causes sloughing of the epidermis. Personally I prefer a thirty-grain (two grammes) nitrate of silver solution, and have not found the relief claimed for the cautey to be uniform; moreover, I think it unjustifiable to afflict a patient with iodoform ointment; but this is, of course, only a personal peculiarity.

Cancer of the Epididymis.—F. W. Rockwell, of Brooklyn,⁵⁰ reported at the meeting of the American Association of Genito-Urinary Surgeons in Washington a case of primary cancer of the epididymis on one and then on the other side, for which both testicles were removed. The disease had not returned

after two years. The doctor had not been able to find any case of primary cancer in this region on record, and considered his case unique.

DISEASES OF THE TESTICLES.

Malarial Orchitis.—E. Calmette,²⁴³ recalling the published testimony of Bertholon and Schmit, in 1886 and 1887, adds five cases of this malady treated in the hospital at Pavia by L. Maggini, going to prove that malaria may cause spontaneous orchitis, sometimes followed by atrophy. He refers to the opinion emitted by Le Dentu and Terrillon, namely, that malaria only plays a secondary rôle in these cases, the foundation of the malady being laid long beforehand by the endemic lymphangitis of hot countries.

An admirable presentation of this subject of malarial orchitis with histories of six cases is given⁹¹ by Charvot. Quinine alone seems to help the patient, and atrophy in some cases cannot be prevented.

Tubercle of the Testicle.—Villeneuve⁴⁶ prefers thorough cauterization with the Paquelin cautery in this malady to castration. He cites cases and defends his position by what appears to be just reasoning.

Hydrocele.—Professor Richet, of Paris,²¹² employs the Van Swieten solution (corrosive sublimate) for injecting simple hydrocele. He injects it warm, which he says takes away the pain, and states that the cure which follows the inflammatory reaction occasions less pain than what follows the injection of iodine. They still appear to cling to iodine as the standard injection for simple hydrocele in France, and very little is heard of the (now) favorite method in America, pure carbolic acid. Even the 10 per cent. solution of chloride of zinc is again advocated in France for injection in the case of hydrocele by Lerond,⁸⁵ the method introduced by Polaillon in 1879. The fluid is drawn off. In a large hydrocele one gramme of the zinc solution is slowly injected a few days after the first tapping and left in. In smaller hydroceles the fluid is only partly withdrawn and a less quantity of zinc injected. It is stated that no inflammatory reaction follows, that the patient may resume his occupation in forty-eight hours, and that the fluid is absorbed in twenty to thirty days. I must raise a personal protest against this method, which I tried in Bellevue many years ago, when it first appeared. Violent inflammation followed, suppuration of bad

quality, and finally tetanus. The same method used by a professional friend effected cure, but only at the expense of a high degree of inflammatory reaction.

Excision of the Tunica Vaginalis.—At the Royal Medical and Chirurgical Society, of London, February 28th, Henry Morris and Mr. Bryant², both related cases in which excision failed to cure the hydrocele. In Morris' case the patient refused further treatment, except palliative tapping. Bryant's case was finally cured by iodine injection.

Gross, in discussing this now favorite method of cure in connection with a paper read in Philadelphia by W. W. Keen, refers to a collection of seventy-eight cases of excision in which there had been one relapse, no deaths. He omits to mention the case of death reported by Bull, of New York. He states that he has never seen a failure occur in simple hydrocele when pure carbolic acid had been injected, and he has collected ninety cases. I have used nothing else for several years in cases of simple hydrocele of the tunic, in spermatocele, in spermatic hydrocele, in encysted hydrocele of the cord, and I have only seen one case which did not get well, more or less promptly, without accident, and in this case (a very small spermatocele) the injection was not properly effected. W. B. Browning, of India,² adds his testimony to the uniform success in his hands, in cases of simple hydrocele, of the injection of pure carbolic acid.

In the matter of excision again, Henry Morris, of London,⁵ gives two cases in which the hydrocele recurred. In both cases cure followed incision and stuffing until granulations obliterated the cavity.

Double Congenital Non-reducible Hydrocele.—Vilcoq and Valat⁷ showed to the Paris Society of Anatomy a specimen of this sort as a rare object. It was taken from a child born at term. Broca, in discussion, declared that the quality of reducibility is not essential in the hydrocele called congenital. He cited a recent work of Wechselmann, who, out of thirty-seven hydroceles discovered at birth, in two hundred and seventy boys born during four months at the Dresden Clinic, found that fourteen communicated with the peritoneum, while twenty-three did not. Zuckerkandl, in investigating the relative frequency of obliteration of the communication between the tunica vaginalis and the peritoneum at birth,

states that in one hundred cases non-obliteration existed in thirty-seven, of which twenty were bilateral, twelve right, five left.

Aspermia in Adhesion of the Tunica Vaginalis.—Reclus⁸ ⁵⁹_{July 14; Aug. 11} asserts that adhesion of the tunica vaginalis does not cause aspermia. In three hundred cases examined, he had found adhesion of the tunic in twenty-four. In twelve the adhesions were partial and in these he had found spermatozoa in the testicle in eight. In the twelve total cases of adhesion he had found spermatozoa absent in only three, and these were in individuals aged respectively seventy, eighty, and eighty-four. He believes, therefore, that aspermia is due to changes in the epididymis and not to adhesion of the tunic, and does not believe that it can result from an operation for the radical cure of hydrocele. If enough inflammation follow to produce sclerosis of the testicle such a result might ensue, but such an amount does not ordinarily follow the radical excision of the tunica vaginalis if antiseptic methods are employed.

Spontaneous Gangrene of the External Genitals.—Oltamare¹⁹⁷_{Apr.} adds a new one to the list of cases of what is known as “*gangrène foudroyante*” of the external genitals. A hard drinker without other known cause developed spontaneous gangrene of a large part of the integument of the penis and scrotum. Recovery followed, and the ultimate damage was less serious than had been apprehended, since erections were possible and not painful.

Demarquay called attention to this particular subject in 1870, Jalaguier and Folet in 1880, Fournier in 1883, Lallemand in 1884, Leloir in 1885, and Bonnière in 1887. Alcoholism seems to be one of the prominent causes. The prognosis is generally better than the appearance of the parts during the activity of the disease would lead one to infer.

Epithelioma of Penis and of Scrotum.—Horteloup³⁶³ ¹⁴⁰_{v. 24, p. 42; Mar. 28} has published a case where no relapse had occurred for four years after amputation of the penis for epithelioma. He always removes all the inguinal glands on both sides, and cuts the urethra one and one-half centimetres longer than the corpora cavernosa, afterward attaching it by suture in such a way that it may remain a little longer than the stump.

F. A. Southam, of Manchester, England,⁹⁰_{Mar.} reports the case of a man of fifty-five, from whom he completely removed the external genitals for epithelioma of the penis and scrotum, with

no recurrence at the end of six years. The only criticism upon this case is that, it appears, the right testicle was first removed for what is called "strumous disease." Twelve months later, it is narrated, "well-marked epitheliomatous ulceration of the penis" was disposed of by amputation of that member. Two or three months later, ulceration returning, and the inguinal glands being slightly enlarged and tender, amputation of the stump of the penis, of most of the scrotum, and ablation of the other testicle terminated the operative measures. The patient is said to have had no history of syphilis, but there is no record given of any microscopic confirmation of the diagnosis of epithelioma.

Incomplete Erection on Account of Varix of the Dorsal Vein of the Penis.—Three cases of this sort are vouched for by F. Parona,¹⁴_{Oct. 21} in which the vein was injected with a half gramme (seven and a half grains) of a solution of chloral hydrate in water, the root of the penis being compressed, and cold applications subsequently made. Perfect cure is alleged to have followed in every case, and the varicosity to have disappeared, erections becoming good. This has a sound of being rather too good to be true.

Seminal Emissions.—Thör, of Bucharest,⁶⁵⁰_{No. 4} advocates in this affection antipyrin, seven to fifteen grains (0.45 to 1 gramme), on retiring. He claims to have completely cured seventeen cases in this way without unpleasant consequences. According to Beart, antipyrin is valuable in sexual neurasthenia, used up to thirty grains (two grammes) a day.

SYPHILIS.

Malignancy.—B. Lewis⁸²_{Sept. 22} is authority for the statement that Fournier at present assigns six causes for malignancy in syphilis; (1) age; (2) scrofulo-tuberculosis; (3) alcoholism; (4) malaria; (5) hereditary predisposition; (6) insufficiency of treatment.

In very early life the disease is grave, as it is also after fifty, and especially after sixty. The scrofulous manifest suppurative and rupial lesions. Alcoholism predisposes to grave and precocious forms, constant eruptions, cachexia, and cerebral syphilis. Poverty is one of the causes of malignancy in syphilis. Nervousness from overwork is a serious factor, directing a localization of the disease upon the brain and cord. Insufficiency of treatment or no treatment is considered by Fournier to be another serious factor in promoting its malignancy.

Suppurating Bubo.—Karl Szadek⁴⁵ gives an excellent review of the various methods of treating chronic conditions of suppurating bubo, the sum of which is that antiseptic incision with thorough scraping and antiseptic dressing is the best method,—a conclusion long since adopted by most practical surgeons in this country. As collaborator of the ANNUAL he has prepared a long digest of his own article, and it is only fair to allow him to speak for himself, which he does as follows:—

“The reason for the great dread in which bubo was held in olden times and the gravity of the prognosis must be sought for in the faulty methods of treatment and the want of antiseptics. Now, with the employment of carbolic and salicylic acid, sublimate, iodoform, or iodol, we can make large incisions, scrape out and remove glands, etc., without danger. The after-treatment is now much simplified by the infrequent changes of the occlusive dressing. The number of cases observed by me is two hundred and seventy-four, all seen during the past five years in the Military Hospital at Kiew, Russia. During the same period one thousand and eighty-four cases of soft chancre have been treated, or one bubo to about every four of chancroid. In thirty-eight cases there was bubo of both sides, and these double buboes occurred for the most part where the sore was at the frænum. The chancroidal bubo appears mostly from three to four weeks after the appearance of the sore, at times two weeks or so after it has been healed. From the beginning of the bubo till it is opened there is a lapse of from two to three weeks (acute phlegmonous adenitis in healthy individuals), more rarely from four to eight weeks (in anæmic and scrofulo-tuberculous persons).

“The method of treatment carried out in the Kiew Hospital is as follows: In beginning bubo, so long as there is no fluctuation or redness of the skin, simple rest and prevention of irritation or injury to the inguinal region, is prescribed, and at the same time appropriate treatment is employed for the soft sore.

“If the skin is reddened, but fluctuation yet not well established over the whole abscess, hot compresses, made with a carbolic solution, are applied until there is established complete suppuration of the swelling. Painting with the tincture of iodine does not meet with favor. As soon as fluctuation is made out in the whole abscess, and it is ripe, a surgical opening is necessary. A mild

degree of chloroform narcosis is recommended, as the necessary steps are very painful. After most careful cleansing of the skin in the inguinal and genital regions and the thigh, with soap, brush, and warm water, and shaving off the hair of the pubes, the field of operation is disinfected with a 5 per cent. carbolic or a 1 per cent. sublimate solution. A free opening is then made, in most cases parallel with Poupart's ligament, by means of a small bistoury. The incision must correspond with the length of the bubo. After evacuating the contents, any recesses or sinuses are to be separated by means of a pair of scissors, and all glands, both those which have suppurated and others which are enlarged, must be removed with the finger, and remnants of glands and firm granulation tissue scraped out with Volkmann's spoon. If an affected gland does not yield, its capsule must be opened with the knife and its contents removed. If the cutaneous covering is destroyed in a large area it is best to cut it away with scissors. It was only necessary in a single case to apply a ligature on account of hæmorrhage. After the bleeding has been stopped with cotton tampons, the cavity is to be washed out with a corrosive sublimate solution, and the whole cavity sprinkled with iodoform alone or mixed with alum, packed with iodoform gauze, and an occlusive dressing applied. The latter consists of a few layers of sublimate gauze and salicylic or sublimate cotton, upon which a mass of jute or tow is placed. The whole is then covered with mackintosh or glazed paper, and fixed with turns of a moist, wide dressing bandage.

"The first permanent dressing, when well-applied and the patient is quiet, can remain from two to five days. If it becomes soaked with the secretions, it may have to be changed earlier. In the second dressing the edges of the wound are washed with carbolic or sublimate solution, the wound covered again with iodoform without washing out the cavity or applying tampons, and a fresh dressing applied. This and the following dressings can, with few exceptions, be left from five to ten days, and changed only if oozing is noticed from the edges. Besides the two hundred and seventy-four chancroidal buboes, there were treated during the same five years twenty-six syphilitic buboes, and twelve times the inguinal glands were removed by operation on account of tubercular adenitis. The duration of treatment of chancroidal buboes averaged thirty days."

Mercurial Subcutaneous Injections.—Szadek²⁸ advocates the use of salicylate of mercury for intramuscular injection, stating that no unpleasant local or systemic effects follow its use, notwithstanding its insolubility. He does not mention the method of use in detail, and claims also good results from its employment locally upon syphilitic lesions, as well as locally (by injection) in subacute gonorrhœa. The drug was first introduced by Silva Arango, of South America.

Kraus⁶⁰ reports a man in recent syphilis who had two subcutaneous injections of calomel, 0.1 each, at an interval of seven days. The mucous membrane of the mouth and cheeks promptly swelled and became livid from effused blood. Bloody stools, vomiting, and anuria followed; coma and death six days after the second injection. Autopsy showed ulcerated bowels, ruptured intestine, peritonitis, and acute parenchymatous nephritis. The previous condition had been good, and it seemed fair to ascribe the lethal disturbances to the mercury.

COCAINE IN GENITO-URINARY SURGERY.

Cocaine has received a moderate share of notice in the journals. H. Phélip²¹¹ alludes to the already pretty well known success to be expected in using cocaine for lithotrity. He has used it eight times, usually injecting three grammes (45 grains) dissolved in forty grammes (10 drachms) of water. He has seen no accident, and believes that if the patient is kept flat and alarm taken at the least nausea, vertigo, pallor of the face, coldness of the extremities, slowing of the pulse, or dilatation of the pupil, the remedy is a safe one. He operated once with the anæsthetizing fluid still in the bladder. This I believe to be bad practice. I did the same on one occasion on a patient who had habituated himself to the use of cocaine in the bladder, injecting as much as ninety grains (six grammes) a day. He nearly died on the table, being pale, convulsed, and so nearly dead that his heart apparently stopped, and breathing had to be performed artificially. He recovered slowly in the Nélaton position of the head, under injections of brandy and ether, with artificial respiration—the bladder having, of course, been washed out at the first indication of trouble, which showed itself by some spasmodic movements of the face, pallor, and incoherence of speech, with slight rolling of the eyes and

dilatation of the pupil. Ether was immediately given by inhalation after the patient came to consciousness, and the operation (litholapaxy) brought to a happy termination without further accident. The patient was out in a few days none the worse for his disagreeable experience.

The death chronicled by Belfield, of Chicago, and alluded to in the 1888 issue of the *ANNUAL* (vol. ii, p. 230), is the first I am acquainted with as being ascribed to cocaine. Within a few months a patient in Bellevue Hospital upon my division was about to be operated upon by the house-surgeon, Dr. Chetwood. A few drops of a 4 per cent. solution of cocaine were first thrown into the urethra, when the patient promptly had an attack resembling mild acute mania, dancing about upon the table in a most uncontrollable manner. His violence, however, quickly subsided.

J. Clark Stewart, of Minneapolis, ⁹_{Aug. 18} injected one and a half drachms 4 per cent. cocaine solution into the urethra, and then shortly performed internal urethrotomy—this upon a healthy Englishman of thirty-two years. He then passed a No. 30 (F) sound into the bladder. After its removal the patient sat up and said, "I feel sick," and "stiffened out, becoming unconscious, with widely dilated pupils, rapid and feeble pulse." He presently recovered, and then after a moment or two again became rigid, perfectly unconscious, and went into a general convulsion. The convulsions were clonic, beginning in face and extending over the whole body, and there was, throughout, partial suspension of respiration and increasing rapidity and weakness of the heart's action. The convulsion lasted, perhaps, two or three minutes, and the patient became deeply cyanosed and then very gradually recovered consciousness, it being about an hour before he was able to leave the office, though there was no repetition of the convulsion. A sound was used repeatedly afterward upon this patient without evil effect. He was found, upon close questioning, to have previously suffered from epilepsy in the shape of the "petit mal."

H. C. Simes, of Philadelphia, ⁹_{July 21} gives an exceedingly interesting history of an Englishman of twenty-nine, who died from the effects of cocaine injected into the urethra. The case is described in full in the department of Anæsthetics, Section O, this volume.

DISEASES OF THE RECTUM AND ANUS.

By CHAS. B. KELSEY, M.D.,
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CONGENITAL MALFORMATIONS.

A CASE of peculiar interest is that of a man ²_{Oct. 20} having reached the age of fifty-four years with an imperforate anus. Immediately after birth fæces and urine were passed by the urethra, the anus being imperforate. An attempt was made to establish an anus in the natural situation, but only a narrow and useless fistulous opening resulted and the passages continued as before, except that fluid from time to time escaped from the anus. At the age of ten years the urethra became blocked with hardened fæces and relief was obtained by an incision into it immediately in front of the scrotum. The result was a permanent fistula, through which the patient continued to pass fæces and urine. He was in the habit of taking a laxative daily, and had to squeeze the fæces through the fistula with his fingers. From time to time the urethral fistula became blocked, and then everything was passed by the meatus. Sometimes, also, the urethra became blocked, and then the fæces escaped by the urethral fistula and the urine by the same opening and also by the anal orifice. The urine was generally normal, though it sometimes contained a brown deposit and had a fæcal smell. He had been married twenty-four years and was the father of one child. His complexion was dark—not unlike that of a patient with Addison's disease. Latterly the urethral fistula had contracted and his difficulty had increased. Three days before admission to hospital the urethra had become blocked and compelled him to seek assistance. On examination a fistulous opening was found in the urethra just in front of the scrotum along which a probe passed readily into the bladder. The urethra between the fistula and meatus was blocked by a fæcal concretion. The anal opening only admitted a fine probe. The urethra was slit up through the fistula an inch and a half and the substance blocking the canal removed. The mucous mem-

brane was then sutured to the skin and the fistula converted into a good-sized opening, through which he continued to pass both urine and fæces so comfortably that he refused further operation.

The case is one coming under the sixth variety in the classification of Papendorf and most other standard writers on the rectum—that in which the anus is absent, and the rectum ends in the bladder, urethra, or vagina. Of these varieties that in which the rectum opens into the vagina is most common. In females the opening is seldom, if ever, into the bladder, but it is sometimes in the urethra. In males it is more often into the bladder than the urethra, and in such cases the rectum may terminate either by a narrow duct running obliquely through the bladder and opening into the *bas-fond* between the orifices of the ureters, or by a free opening (Kelsey).¹⁰²⁴

These cases are rare and generally are quickly fatal from intestinal obstruction or from cystitis, and in this consists the great value of this report. For though several have been reported in which life has been prolonged three or four years, the one mentioned by Gross and quoted by me,¹⁰²⁴ in which the patient lived to the age of thirty years, has, up to the present time, been considered quite phenomenal. In this case, however, the man had lived fifty-four years, was the father of one child, and after the relief given by the slight operation mentioned bid fair to get along without further trouble. The opening was evidently urethral and not vesical—a point in the diagnosis often very difficult to decide and having a great influence on the prognosis.

Maas, of Wurzburg,³³⁶ reports a remarkable case of immense diverticulum from the rectum. The patient was a boy, aged 14. Shortly after birth the abdomen began to swell, and increased in size as years passed by, without affecting the general health, till the age of 13. At this time the swelling became much larger and caused dyspnœa and palpitation. Congenital hydronephrosis on the left side, or cystic degeneration, was diagnosticated. An exploratory incision was made, but the idea of an operation was abandoned, and the boy died suddenly. The tumor proved to be an immense diverticulum from the upper part of the rectum filled with fourteen litres of thin fæces and containing gas. The opening of communication was at the posterior and inferior aspect of the pouch. The rectum was strongly compressed by the tumor.

Auvar¹⁸⁴ reports the case of a child born at the end of the eighth month, after a normal labor. There was a cylindrical tumor three or four centimetres in diameter at the site of the umbilicus, which included the elements of the cord and was covered with amnion. On the anterior aspect of the cord, at a distance of three centimetres from the umbilicus, was an opening, large enough to admit the end of the little finger, and from it escaped a thick, greenish fluid, having all the appearances of meconium. The anus was permeable and the genitals (male) were normal. The cord fell on the tenth day, leaving an umbilical tumor as large as a walnut, in which there was an opening on the anterior superior aspect. A sound penetrated this opening six centimetres.

The child did badly from the first, and died on the thirty-fourth day from progressive athrepsia. The abdomen having been opened, a loop of intestine was found opposite the umbilicus, from which a diverticulum proceeded to the umbilical opening.

ABSCESS AND FISTULÆ IN ANO.

Zeller¹⁰¹⁷ discusses the proper incision for deep perirectal abscesses, which are either above or below the levator ani muscle and generally situated either laterally or anteriorly in relation to the rectum.

Those located above the levator may start in the prostate or surrounding connective tissue. In the prostate they begin as isolated small foci, flowing together, and finally connecting the entire gland into one large abscess cavity. They are the result of gonorrhœal infection, violent catheterization, or inflammation spreading from the gut through the many lymphatics and blood-vessels. Some of them are due to infection from ulceration of the rectum, and others are tubercular in character, gravitating toward the rectum instead of the psoas muscle. Many are of very doubtful causation. The diagnosis is generally easy if the symptomatology leads to rectal examination. Regarding the termination of the abscess, Ségond has collected important statistics. Thirty-five perforated the urethra and seventy-seven other parts, generally the rectum, but occasionally the perineum, the ischio-rectal fossa, and the obturator foramen. The prognosis is not favorable; 20 per cent. are fatal, and many leave fistulous communications with urethra or rectum which are never cured.

The usual treatment of these abscesses has been to incise them from the rectum when they have pointed in that direction, but Zeller advocates a perineal incision whenever possible, even after pointing has taken place into the rectum. He objects, very properly, to the incision into the rectum that it is too small, does not tap the abscess at the most dependent part, is not free from risk of hæmorrhage, and does not prevent the formation of a urethro-rectal fistula, which is much more intractable than a urethro-perineal fistula. When practicable, I advocate the perineal incision, but from my own experience judge that it will seldom be found so. I recall several cases of large abscesses high up in the pelvis which could only be reached through the rectum at a point above the prostate. These have generally done well when the opening was made large and kept patulous by the frequent introduction of one finger. None the less, if by examination it seems possible to reach the abscess by a dissection from the perineum it should be attempted. After the skin incision no cutting instrument should be used, the way being gradually opened up with a blunt instrument, like the closed blades of a dressing forceps.

Morton⁶⁰_{Nov. 26, '97} reports the cure of an unusually long fistulous track by a single operation. The external opening was a little below the middle of the posterior aspect of the thigh. The skin and adjacent tissues were indurated, and a probe passed a little more than three inches directly toward the sciatic nerve. Upon a grooved director a knife was carried in and the track slit up. It was found to extend up the thigh, the tissues being successively divided till the buttock was reached. After this also had been divided the track approached the surface and finally opened into the bowel about half an inch above the external sphincter. The distance between the two openings was twelve or fourteen inches, and there was no indication in the intermediate tissues of any communication between them. The fistula was thoroughly curetted, the cut edges brought together with deep sutures and dressed antiseptically. Union was secured by first intention over the whole distance.

Benton⁶⁰_{June 14} defines horseshoe fistula as a complete fistula with the external opening on the side opposite the internal opening into the rectum. He gives, however, seven cases of blind, internal horseshoe fistula—a variety not before described by name, but

which has always been recognized. The name is intended merely to indicate the semicircular burrowing which has taken place, and is of little distinguishing value.

H. W. Allingham, Jr.,²² calls attention to the incontinence of fæces following operations for fistula. For this condition he recommends freeing the ends of the muscle by a deep incision through the old cicatrix and allowing the wound once more to heal from the bottom by granulation.

I have been in the habit of excising completely such a cicatrix, exposing freely the divided ends of the sphincter and bringing them together by deep sutures, exactly as in cases of lacerated perineum, and have found it to work well. In cases in which one or both sphincters have been divided in two places and often obliquely, Allingham makes no attempt at restoration of the muscular continuity, but produces an artificial stricture of the anus by the free use of the Paquelin cautery, dividing the muscle deeply at several points.

For cases resulting from the division of comparatively small perineal fistulæ in women, in which the incision has involved the decussation of the vaginal and rectal sphincters, he recommends Tait's operation on the perineum or else the same cautery treatment as in the last variety. I believe that many cases of fistula cannot be cured without complete paralysis of the sphincters from division; but in many in which paralysis occurs it might have been avoided had the knife been properly used. When, however, this unfortunate result has been reached, as it may be by the best operator, there is still much to be gained by a carefully considered plastic operation of the general plan proposed in the first class of cases; or, failing in this, it is often possible to produce a stricture of the anus with the cautery, which, though without real sphincteric power, shall be a great improvement on the condition of absolute incontinence.

INTESTINO-VESICAL FISTULA.

Cripp's monograph¹⁰¹⁸ on this little-understood affection is based upon a study of sixty-three cases found by him after very considerable research.

The sixty-three cases are grouped as follows: traumatic, two; cancerous, nine; inflammatory, forty-five; unascertained, seven. In

one of the cases of traumatism an immense slough followed a prolonged labor, and in the other the patient was impaled on a stake, causing a wound through the bladder into the rectum. The author expresses considerable surprise at the smallness of the proportion of cancerous cases, and in part accounts for this by the rapid formation of fungoid tissue in cancerous disease which tends to block up any opening formed by slough. Even in cases where cancer has been the primary trouble the perforation seems to have resulted just as often from the bursting of a secondary abscess as from the extension of the growth itself. Forty-five cases, or over 70 per cent., originated in some form of inflammatory mischief, including simple ulceration. In two cases stone in the bladder seems to have been the cause of the fistula, but the more likely explanation is that the stone was the phosphatic deposit round a faecal mass. The cases of inflammatory origin arrange themselves as follows: abscess, fifteen; stricture, eight; ulcer, four; stone, two; exact nature not described, sixteen. In fifteen cases absolute proof was obtained that the fistula was the direct result of an abscess bursting both into the bladder and bowel, while in many of the unclassified cases there is strong suspicion that the trouble arose in this way. In eight cases the fistula was secondary to fibrous stricture. In some of these the strictured portion was firmly adherent to the bladder at the point of perforation. In others the intestine above the narrowed part was much dilated and the fistula appeared as the result of an ulceration commencing in the dilated pouch, the bladder having previously become adherent. In three cases only is the communication described as caused by simple ulcer. In each the bowel was adherent to the fundus of the bladder at a single spot through which the perforation had occurred. In these the ulcer may have been the primary affection, or an adhesion may have first existed which subsequently ulcerated. It is, however, certain that in the great majority of cases the initial lesion is rather intestinal than vesical.

The symptoms on careful inquiry will generally be found to point to intestinal trouble considerably antedating the vesical and generally of an ulcerative character, but in some cases they are those of an abscess bursting both into bladder and rectum, and again they may be identical with those of vesical calculus. A

time comes, however, and generally suddenly, when the urinary symptoms become greatly aggravated, suggesting the onset of acute cystitis, and about this time the patient is often horrified by discovering that air is passing through the urethra and escaping with a bubbling or explosive sound on micturition. Then follows, sooner or later, the appearance of fæces in the urine. At first this is small in quantity, forming a fine sediment easily mistaken for that of simple cystitis, but the amount is soon increased and the urine takes on a thick, muddy appearance. As soon as solid fæces begin to block the urethra the condition becomes truly terrible and the downward progress very rapid. With few exceptions, the pain is intense, in one case leading to self-destruction. Retention of urine from obstruction of the urethra by fæces is common, in one case ending in fatal extravasation.

Although fæces readily pass from rectum to bladder, there is generally no passage of urine into the bowel. This must be due to the valvular nature of the opening. The coma and delirium which frequently end the scene are probably of toxic origin, for in some cases urine undoubtedly escapes into the bowel in large quantities and may be absorbed.

The prognosis is most unfavorable. In the cancerous cases death is much accelerated by the perforation. In the cases due to inflammation the mortality is very high—73 per cent. in thirty cases in which there was no operative interference. In the majority of cases the patients only lived a year or two after the perforation and many only a few months. In one or two cases, however—those in which nothing much but air escaped into the bladder—the patients lived several years. In a small percentage of cases a spontaneous cure has resulted, the symptoms of perforation having been of short duration. But unless the closure occurs within a few weeks the opening may be put down as permanent.

As to diagnosis, the passage of air generally precedes that of fæces. At first the air is so slight in character that it will best be detected by the patient while micturating under water. When fæces come away in any quantity there will be no difficulty in detecting them, but when small in amount and perhaps mixed with the products of cystitis they are not so easily identified. The urine should be allowed to settle in a corked bottle turned bottom up, and a little of the deposit on the cork examined under the micro-

scope, when minute particles of excrement can readily be detected with a low power.

When the fact of communication has been established two important questions arise—first, whether the cause be cancerous or inflammatory, and, second, as to the site of the perforation. The first is of vital importance as to prognosis and treatment.

If the trouble be situated in the lower part of the rectum the nature of the disorder can be ascertained by digital examination. Occasionally some light may be obtained by examination of the matter passed both by rectum and urethra. Broken portions of malignant growth may thus be detected. If cancer of the rectum has so far advanced as to perforate the bladder there will probably be characteristic general symptoms, and, lastly, in the absence of definite symptoms to distinguish cancer from inflammation it must be remembered that the chances are in favor of the latter. It is of the utmost importance to ascertain, if possible, where the opening is situated, as upon this turns the whole question of the treatment by colotomy. In sixty-three cases the opening was found to be as follows: rectum, twenty-five; small intestine, twelve; colon and small intestine, five; colon, fifteen; unascertained, six. The rectum was the portion implicated in nearly half the cases, and generally the opening was in the middle portion of the rectum. In no less than three instances where the primary disease was in the rectum an abscess had extended high up beyond the limits of the pelvis and then burst into the ileum, cæcum, and bladder.

The colon was involved in fifteen cases, and in every case where the exact location could be ascertained it was in the sigmoid flexure. From these data two facts of great importance are established: the one, that communications with the large bowel are about twice as common as those with the small; the other, that in all cases of communication with the large bowel the opening existed either between the rectum and bladder or the sigmoid flexure and bladder, so that all would have been relieved by *left* lumbar colotomy. There is not a single case where any advantage would have followed an opening in the right side which would not have followed one in the left. It may not be possible in any individual case to decide whether the opening is in the large or small bowel.

A careful bimanual examination of the rectum under either

may settle this point, for though the opening may not be found, the disease which has caused it may be felt, and it is generally safe to assume that the opening is not far from the location of the process causing it. Should this fail, injection of milk into the rectum to see if it immediately appears in the bladder, and *vice versa*, may be of great assistance. But the failure of this test may be due to a valvular shape of the communication. Help may be afforded by the character of the faecal discharge through the bladder. The more ill-digested the matter is, the higher in the bowel will the fistula be located; while, on the other hand, perfectly formed faeces indicate an opening in the sigmoid flexure or rectum.

The treatment is operative and palliative. When, from the history, the opening appears to have followed immediately on the opening of an abscess, it is right to defer operative treatment for a while, on the possibility of the opening closing spontaneously. On the other hand, when the history points to malignant disease or stricture, the sooner operative treatment is undertaken in suitable cases the better.

The author thinks three methods of operative treatment theoretically possible: (1) colotomy, in order to divert faecal matter from the bladder; (2) supra-pubic cystotomy, to allow free drainage of the putrid contents of the bladder, and with the possibility of being able to close the fistula by an intra-vesical operation; (3) abdominal section, in the hope of separating the intestine from the bladder and closing the communication.

The effect of colotomy on the condition of the bladder is most satisfactory, the urine again becoming clear and the symptoms of cystitis disappearing. The chief question, however, before performing colotomy is one of diagnosis; for, obviously, if the communication be with the small intestine or caecum the operation will be worse than useless. The choice of operation is between the inguinal and left lumbar operations. The inguinal is hardly suitable, because the sigmoid flexure is so often strictured and firmly bound down to the bladder and neighboring parts. It must not be expected that the urine will at once become clear on the performance of left lumbar colotomy. No amount of care in doing the operation will at first prevent a certain portion of faeces passing into the bowel below the opening; but if the bowel has been well drawn out and freely opened the faeces will nearly always,

in the course of a few weeks, all pass through the artificial opening.

Supra-pubic cystotomy has probably never been performed for these cases; but if the condition pointed strongly toward an opening in the small intestine an attempt to close the opening by an intra-vesical operation would be justifiable, except in case of malignant disease. If, after opening the bladder, it was found impracticable to close the fistula, at least a free drain would be established, thus avoiding the constant painful catheterism often necessitated by the impaction of fæces in the urethra. An abdominal section with the view of separating the adherent bowel from the bladder would probably be impracticable.

The palliative treatment must consist chiefly in selecting a dietary which causes the least irritation to the bladder, in keeping the bowels slightly confined, so that the passages may be solid, and in daily washings of the bladder with warm water.

URETHRO-RECTAL FISTULA.

Wyeth²⁵⁷ reports the case of a man, aged 27, who had a urethro-perineal fistula resulting from an operation for stone. Four attempts had been made to close this without success. In the last of these a drainage-tube about one and a half inches long was inserted in the perineal opening and left with the deep end in the urethra. This tube, about three-sixteenths of an inch in diameter, was lost sight of, and both doctor and patient supposed it had fallen out and been thrown away in the dressings. The last operation was followed by considerable persistent pain. In the course of three months an abscess opened into the rectum through the anterior wall, and the urine began to flow freely through this new channel. About this time the perineal opening was closed, and abscesses formed in each tunica vaginalis, which were incised and healed. At this date nearly all the urine passed per rectum, and the patient suffered so greatly that he had to be kept constantly under the influence of opium. An examination per rectum revealed the presence of a stone, the end of which was on a level with the anterior surface of the rectum, about one inch above the anal aperture. This was removed through the rectum by means of strong forceps and found to be a concretion around the lost drainage-tube. The patient was then etherized and placed in

Sims' position and a large Sims' vaginal speculum introduced. The opening through the anterior wall of the rectum measured three-quarters of an inch in length, with an irregular width of from one-eighth to one-quarter of an inch. It led directly into the urethra near the junction of the membranous and prostatic portions. The floor of the urethra was entirely destroyed. The right edge of the opening was slightly undermined.

It was decided to attempt the formation of a new floor to the urethra by turning the mucous membrane of the rectum into this position. Two crescentic incisions were made about parallel with the edges of the opening, but approaching more closely at its upper and lower angles.

These incisions went deeply into the wall of the rectum and included the mucous and muscular layers. The two lateral flaps were dissected up and turned toward each other, their raw surfaces looking into the rectum and the mucous surfaces into the urethra. Sutures of silk-worm gut were inserted about three-sixteenths of an inch apart, so that they did not penetrate the cavity of the urethra. A Nélaton's catheter was carried from the meatus into the bladder, and through it the urine escaped at intervals. Whenever the urine accumulated enough to create a desire to expel it, about six ounces of Thiersche's solution were thrown in to dilute it, and when this, with the normal contents of the bladder, was evacuated, about the same quantity was thrown in again and immediately expelled. In this way the wound was kept free from irritation by the urine. The bowels were confined for nine days; the sutures were left *in situ*; the wound healed promptly, and the patient left for his home three weeks after the operation.

FÆCAL FISTULA.

McGill,⁶ reports a successful operation for fæcal fistula in a woman who had been thrice treated for strangulated inguinal hernia. The patient, aged 41, was suffering from a fæcal fistula in the right external abdominal ring of seventeen years' duration, and with the following history: When nineteen years of age patient ruptured herself in right inguinal region. She went about for five years without wearing a truss, the protrusion being all the while reducible, and then the hernia became strangulated and was reduced by operation. She left hospital three weeks afterward,

wearing a truss, but with a small opening in the inguinal region discharging fæces. For nine years the hernia remained reducible, but was kept back with difficulty by a truss. The sinus also remained open. At the end of this time the hernia again became strangulated and the patient was again operated upon at the same hospital. The hernia was reduced, but the fistula increased in size, and for six weeks all the motions were passed through it. Fæces then began to pass per rectum and soon very little came through the wound. At the end of three months she left hospital with a hernia as large as a fist, reducible, but not retainable, by truss, and with two sinuses discharging a small quantity of fæces. Last January, during a fit of coughing, the hernia again became strangulated and was again operated upon. An attempt was made at the same time to close the fistula, but fæces escaped when the dressings were removed. The patient left the hospital with a large fistula through which all the fæces escaped.

On admission a large fæcal fistula existed in the right groin, in the position of the external abdominal ring, about an inch in length, through which all the fæces escaped. A hernia the size of the fist came down when the patient stood up, and into this the fistula opened. There was no control over the motions. It was decided to attempt to close the fistula. On the day before operation the bowels were well cleared by castor oil, and an enema was injected into the fistula on the morning of the operation. An incision was made round the fistula close to its edge down to the adhesions connecting the bone with the parietal peritoneum, and these adhesions were dissected and torn through and the affected part of the bowel drawn out of the wound. The fistula was found to involve about half the circumference of the gut. The edges of the fistula were pared and brought together by Lembert's sutures, chromicised gut being used. The gut was then returned into the peritoneal cavity, the opening into the peritoneum sutured, and a set of deep silver sutures used to draw together the pillars of the external abdominal ring. The superficial parts were sutured with gut and a tube put in. The wound was dressed with gauze, iodoform, and salicylic acid. No vomiting occurred. Milk and ice were given. The wound was dressed and tube removed on third day, and the same day patient passed flatus per rectum. On the ninth day the bowels moved per rectum after an enema, the deep parts

had united, but the superficial were healing by granulation. On the sixteenth day she was given a laxative, after which the bowels were moved twice, and on the eighteenth day the patient sat up in a chair. Subsequently she progressed rapidly and the bowels moved naturally every day. During the fifth week one of the silver sutures had to be cut down upon and removed. The patient left hospital on the forty-fifth day after operation, and afterward stated that she was quite well and able to do housework.

HÆMORRHOIDS.

Whitehead's Operation.—In the literature of the year on hæmorrhoids, the discussion for and against carbolic acid injections still goes on, nothing of much importance having been added. It may be said, however, that the tendency of its advocates is strongly toward solutions of weaker strength (10 and 15 per cent.).

Whitehead's operation has also been submitted to various trials. Allingham, Jr.,²² JUNE 27 suggests new instruments and methods for its performance. One of the former is shown in Fig. 1.

The patient is put in the lithotomy position and the sphincters dilated. Then, with the instrument closed, one of its arms is attached to one part of the bowel, just where skin and mucous membrane join. The other three arms are attached in the same way, and the instrument is screwed up till the opening becomes tense and square, as shown in Fig. 2. Now, with a small knife, with the finger of the other hand in the bowel to guide the knife and keep it from perforating the mucous membrane, a cut is made at the junction of skin and mucous membrane all around the anus. This can easily be done with the parts thus tense. When the mucous membrane has been separated all around up to the level of the internal sphincter the condition is as represented in Fig. 3.

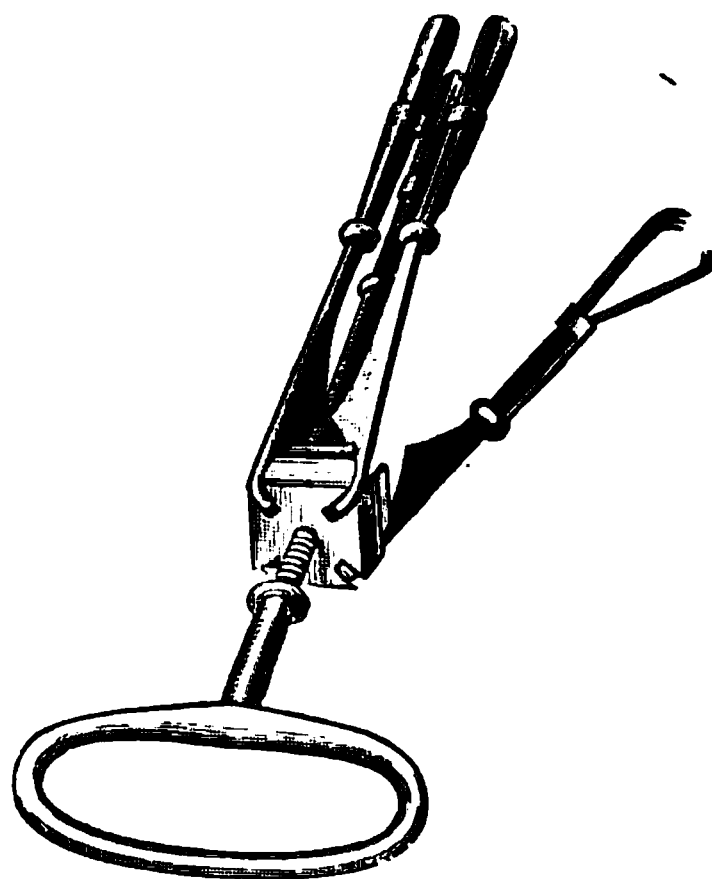


FIG. 1.—ALLINGHAM'S DILATOR.
(*Medical Press and Circular.*)

Then, opposite the position of any large pile, the skin is taken



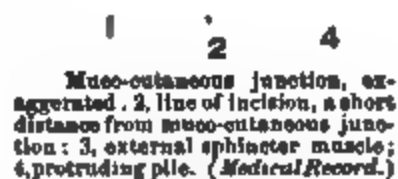
FIG. 2.—ALLINGHAM'S DILATOR IN POSITION. (*Medical Press and Circular.*)



FIG. 3.—APPEARANCE AFTER SEPARATION OF MUCOUS MEMBRANE. (*Medical Press and Circular.*)

up at D, with a needle fitted with a medium catgut ligature, passed through the mucous membrane at C, and then round the stem of the pile; returned again through the mucous membrane at B, and lastly through the skin at A. Thus, a loop is formed under the bowel with the two ends coming out through the skin. The ligature is now tied just tight enough to prevent hæmorrhage, when the piles are cut off. The drawn-out pile area, still attached to the clamp, is now cut off just in front of the ligature and a few catgut sutures are put in so as to bring the skin and mucous membrane together between the piles. The parts are then powdered with iodoform.

Weir,⁵⁹ also suggests modifications in the technique. He shows that the mucous membrane cannot be dissected up from the protruding pile, as the hæmorrhoid involves both mucous and submucous tissues. It is, therefore, necessary to go somewhat through the pile, as shown in the figure, looking out carefully for muscular tissue, and keeping to the inside of this until the mucous membrane, recognized by its lighter color, is reached



1 2 4
Mucocutaneous junction, exaggerated. 2, line of incision, a short distance from mucocutaneous junction; 3, external sphincter muscle; 4, protruding pile. (*Medical Record*.)

PORTION OF MUCOUS MEMBRANE STITCHED TO THE SKIN. (*Medical Record*.)

above the pile region. After this latter membrane has been found its separation from the muscular tissues is very easy, only an occasional snip of the scissors being required to detach adhesions.

He also cuts away the mucous membrane, half an inch at a time, and stitches it to the skin by interrupted, fine, black-silk sutures, until the whole circumference is removed, as shown in the figure.

On the whole, Weir's impression of the method, founded on six cases, is favorable in those cases of severe disease which involve the whole circumference of the anus. He compares the results, however, only with those obtained by using the ligature.

The operation is founded by its inventor upon the following propositions, all of which appear to me to be at least open to discussion.¹_{Dec. 8} He says: "During the first five years of my professional career I employed the ligature in the few cases of severe hæmorrhoids that came under my treatment. I operated according to the most approved method of that time, cutting through the skin and mucous membrane, and applying the ligature to the artificially produced pedicle. The number of cases operated upon did not, perhaps, exceed a dozen; nevertheless, they were sufficient to convince me that the ligature by no means produced a radical cure. One of my patients returned almost as bad as ever, and the reports I heard of another were anything but satisfactory."

This statement is so obviously open to criticism that it seems almost heartless to comment upon it. A young man in early practice operates a dozen times and two of his cases are failures! Older men operate thousands of times and never have a failure! Whatever else may be raised as an objection to the operation by ligature, this, I believe, is the first time it has ever been impeached on the ground that it was not radical. Men have objected to it because it caused pain, because it had been followed by untoward consequences, and because they believed a radical cure could be obtained by other methods preferable; but never because it failed to cure.

The second proposition is better stated and less open to obvious criticism, but none the less, I believe, an error. The author says: "After abandoning the ligature I adopted the clamp and cautery. . . . My experience, which exceeded fifty cases, resulted eventually in the conviction that it was decidedly inferior to the ligature. The immediate risks I found to be greater, and the failures by recurrence more numerous. Certainly it was more frequently followed by secondary hæmorrhage, and I am acquainted with cases where the bleeding which is reported to have

taken place must have been little less alarming after the use of the clamp and cautery than that which occurred in those days when hæmorrhoids were unceremoniously excised and no precautions whatever taken to arrest hæmorrhage. These cases were operated upon by surgeons of recognized repute in this special method of treating piles. I consider that a plan of treatment which fails to compass that special end for which it was designed, and, in addition, has other obvious disadvantages, besides the further objection of being somewhat difficult to understand and complex in execution, loses its position in surgery, and must give place to other operations which involve less risk, give better results, and do not require any special surgical training."

Looking at this sweeping condemnation a little more closely, I find that the author, with an experience of fifty cases, found "the immediate risks to be greater and the failures by recurrence more numerous" than by the ligature. What immediate risks *he* found he does not state, but he heard of cases of secondary hæmorrhage in the practice of others. What percentage of failures he had he does not state, only that the results were worse than by the ligature. If by this is meant that while he failed in two out of a dozen cases with the ligature, he failed in a still greater percentage with the clamp, his results were indeed bad. How are we to compare his results with those of Allingham and Smith, who number their operations by these two methods by the thousands and never report failures? Smith never speaks of any difficulty in understanding or practicing the clamp operation or of any particular "special surgical training" as necessary for its performance. Indeed, I know of nothing much simpler than to pinch up a pile with a clamp and, after cutting off a part, burning the stump which remains.

The author does not sufficiently particularize what "immediate risks" he found to be so great. I never have heard of any immediate risks beyond the risk attending the administration of an anæsthetic. Nor does he tell what the additional "obvious disadvantages" were.

I will not, however, argue the question. The author tried it and did not meet with success, while other men have practiced it for a lifetime and found it perfectly satisfactory and eminently free from all the objections which he raises.

The third proposition is this:—

“I do not consider that any surgeon has a thorough conception of hæmorrhoids until he has performed the operation of excision. He may have dissected the *cadavre* any number of times with the special object of studying the structure of hæmorrhoids, but it is only on the living subject that dissection will reveal their true nature. It is these vivisections that have confirmed my belief in the inefficiency of the ligature and clamp, and they have revealed, also, the cause of failure. In surgical literature we read of hæmorrhoids as distinct individual tumors, but the vivisections I have referred to demonstrate that the entire plexus of veins surrounding the immediate interior of the gut is at fault. Without doubt the hæmorrhoidal condition is marked by special protuberances at certain points in the circumference of the gut, and these I find have a pretty uniform position, owing, no doubt, to the regular disposition of the fibrous septa. But the essential fact remains that, though possibly concealed by these masses, there are minute venous radicles behind and between the main tumors.” I interrupt the author’s remarks at this point merely to call attention to the fact that he has asserted something which nobody has ever denied—the veins of the rectum anastomose.

He goes on to say that these small venous radicles “are now as small as their larger neighbors once were, but let the latter be removed by clamp or ligature, and the apparently insignificant veinules will dilate and take their place, the very removal, perhaps, affording room for growth, and, whilst taking off external pressure, leaving the tension within increased. It is on the removal of these rudimentary piles that the permanence of the cure and the future welfare of the patient depend.”

The calling of a “minute venous radicle” a “rudimentary pile” is, I believe, an entirely new and original pathological idea, very analogous to the assertion that the normal arch of the aorta is a rudimentary aneurism. The whole proposition seems to us rashly stated, unfounded in fact, incapable of proof, and unsupported by the clinical experience of the greatest authorities.

In the first place, the author may argue as he will about the causes of his failures in operating by the two methods he condemns, other men who have practiced the operations longer do not fail, and with them minute venous radicles do not develop

into piles after they have operated. With them the removal of three or four sections of the mucous membrane with the clamp or the ligature and the substitution of firm cicatrices for hæmorrhoidal tumors do not lead to the development of new hæmorrhoids by "affording room for growth," "taking off external pressure," and "leaving the tension within increased."

The question is not one for pathological discussion or in any sense for argument; it is one of clinical fact. Does the ligature operation or that with the clamp cure or does it not? On the negative I do not consider Whitehead's experience of twelve cases with the ligature and fifty with the clamp as any offset to the figures of Allingham and Smith, nor do I believe that those who are practicing Whitehead's operation to-day are doing so because they have found the others to be unreliable. Both the ligature and the clamp will cure, but it is possible to imagine something better than either in certain particulars—something that will cause less pain, less confinement to the bed, less sympathetic vesical disturbance, and less danger of surgical accident. This it was hoped carbolic acid injections would supply, and this hope proving unfounded it is natural to try the next thing—excision. If this gave a more permanent cure than the older methods, which it does not, and if it were attended by less subsequent pain and a more rapid recovery, which it is not, it would very soon take their place. Otherwise it will surely give room to the next properly attested method which is brought to the notice of the profession. For if it have no great advantages in its results it will inevitably be carried out of practice by the inherent difficulty of its performance. The author speaks of the clamp operation as "being somewhat difficult to understand," and as requiring "special surgical training." Its performance by a practiced operator is a matter of seconds, not minutes. It is more rapidly done than the ligature, and both can be done in less than one minute, or could be before so much time was devoted to antiseptics. An operation such as these will not be abandoned for an elaborate dissection like Whitehead's until the latter has been proved to be in many ways preferable; and I venture to say that this has not yet been done. Whitehead himself does not give results in sufficient detail to enable us to judge on the points necessary for a decision. He says:—

“ I have now operated upon more than three hundred patients without a death, a single instance of secondary hæmorrhage, or one case where any complication, such as ulceration, abscess, stricture, or incontinence of fæces has occurred.” This is certainly a good result, but nothing exceptional and certainly no better than can be shown by either the clamp or the ligature in other hands than his.

The points upon which the merits of the operation must rest are not that it cures and fails to kill, but the amount of pain and constitutional disturbance it causes. He says “ the patient sits up on the fourth day, and is in condition to resume work within a fortnight ;” that he rarely finds much pain after the operation, and only occasionally uses the catheter. These are also good results, but not exceptional or confined to his method.

On these points Weir⁵⁹_{July 14} has given some more accurate data from his experience of six cases.

As the cases are well and clearly reported, I take this opportunity of examining them, and through them the results of the method, rather closely.

Regarding the first case, it is stated that much less pain was experienced after the operation than is often observed after the operation of ligation ; that on the eighth day the line of suture was completely healed, and a week later he was discharged from hospital perfectly well, with a clean and well-shaped anus, only two sutures remaining attached to the skin, and these causing no trouble. In the second case the patient urinated voluntarily after the operation, the bowels moved without pain on the seventh day, and he was walking about on the twelfth. The stitches were removed and he was discharged on the eighteenth day. In the third case the patient suffered a great deal of pain after operation and the urine had to be drawn once ; perhaps, however, both these facts may have been attributable to the increased stretching and manipulation of an examination for a possible stricture. The bowels moved painlessly on the seventh day ; on the eighth the wound was found to have united primarily with the exception of a small area, and on the thirteenth day he was up and about. In the fourth case there was no reaction whatever after operation, there being no pain and the urine being passed voluntarily. He was sitting up in bed on the third day and about on the sixth.

The majority of sutures were removed on the tenth day. In the fifth case these particulars are not given, but in the sixth the patient was catheterized during the first twenty-four hours. The subsequent progress was painless, the patient was able to sit up in bed squarely on the affected part at the end of the third day, and was dressed within a week.

Weir compares these results very favorably with those of the ligature method, and I think with perfect justice. The recovery is quicker and the reaction, as shown by pain and difficulty in urination, is less. But with regard to the clamp and cautery methods the same certainly is not true. It is now many months since I have used the catheter after an operation for hæmorrhoids, so many that I do not know if I possess such an instrument, and a case in which the patient is not able to report at my office in a week after operation is an unusual exception. Indeed, I have difficulty in keeping my patients under observation after the first week. I had a letter from one this morning who disappeared on the seventh day, telling me he would come and see me if I wished, but that he was all right—and this is not an unusually good result.

For exactly the reasons that Weir prefers Whitehead's operation to the ligature I prefer the clamp to both. All three of them give the same satisfactory results in the end, but the clamp and the method by excision cure with less pain than the ligature, and the clamp operation is much simpler than that of excision, while possessing all of its advantages.

COLOTOMY FOR CANCER.

H. W. Allingham, Jr., ²_{Apr. 28} contributes an interesting paper on the causes of failure to find the colon in the operation of lumbar colotomy and the way to obviate them. The difficulties sometimes met in finding the large bowel and the occasional cases in which serious errors have been made are known to all; and all will agree that unless one of the longitudinal muscular bands, which are invariably and only found in the large intestine, be seen, the intestine should not be opened from the loin. These bands are described as being situated, one on the anterior surface, another along the inner part, and the third at the posterior aspect of the gut. It is this posterior band that is looked for and generally

supposed to be seen when searching for the bowel in the lumbar region. It is thought by some authorities that these bands can be easily detected without opening the peritoneum, but this is not so except in a very few cases.

The author finds from examination and dissection of over one hundred ascending and descending colons that the bands are always more easily and distinctly seen when they are covered by the peritoneum, which makes them hard, prominent, and shiny; whereas, when the peritoneum is stripped off them these characteristics are lost. He admits that in eight cases out of one hundred examined one or two of these bands could be seen, but not very distinctly, on the posterior part of the intestine, although they were uncovered by peritoneum. When the peritoneum only covers about one-half or two-thirds of the circumference of the gut, it is generally reflected off the gut at the longitudinal bands on to the walls of the belly. Thus, unless the peritoneum is stripped off, the bands are not visible. If an attempt is made to expose these longitudinal fibres the peritoneum, owing to its being so firmly adherent to them, is frequently torn and the peritoneal cavity opened, perhaps unknown to the operator. It is argued, in favor of lumbar colotomy that the large intestine can be reached without opening the abdominal cavity. This, of course, is possible, yet it is much more important to make certain that the large intestine is being opened by first seeing the longitudinal bands. This, from the anatomical points mentioned, can only be done by opening the peritoneum. Moreover, the author proposes to prove that in this way only can the large intestine be found with certainty in most cases. He is strengthened in these conclusions by three cases in which he operated on the right side in the dead subject, where it afterward appeared that if he had not looked carefully for the longitudinal bands the descending portion of the duodenum would have been opened instead of the large intestine. This occasionally happens in operating on the living.

It is some years since Mr. Allingham, Sr., came to the conclusion, after careful investigation, that the best incision for finding the colon was one with its centre quite half an inch posterior to midway between the anterior superior and posterior superior spines of the ilium, and midway between the last rib and the crest of the ilium. This incision should be limited in length to between two

and three inches, for this compels the operator to cut down exactly to the position in which the colon generally lies; whereas if, as is frequently the case, the length of the incision is five or six inches, the operator runs the risk of missing the gut. Moreover, another advantage of the small incision is that afterward there is no prolapse of the gut and very considerable sphincter power is attained. For it is obvious that if a large wound is made, which does not heal by first intention at the anterior and posterior part, a weak cicatrix is left in the abdominal wall, and there is, consequently, a loss of muscular power over the new anus.

The general position of the colon is shown in Fig. 1. This, according to Treves, is found to be the position in seventy-four cases in one hundred on the right side, and in sixty-four cases in one hundred on the left side. Allingham finds it to be the case in eleven cases out of sixty on the right side and ten out of sixty on the left side. The percentage is eighteen and one-third cases out of one hundred on the right and sixteen and two-thirds out of one hundred on the left. From this it would appear that this position of the gut is less common than generally supposed. With the intestine in this state, and a longitudinal muscular band seen, which must be uncovered

FIG. 1.
(*British Medical Journal.*)

by peritoneum, all should go well, and there is little or no difficulty in operating. But when no bands can be seen, owing to the peritoneum covering them, the best distinction between large and small intestines is wanting; therefore, knowing that the small intestine is frequently exposed by opening the peritoneum unwittingly, the author considers it much more advisable to open the peritoneum intentionally and search for a piece of intestine with longitudinal bands than to run the risk of opening the small intestine under the impression that the peritoneum has never been opened at all, and that it is the large intestine which is being dealt with.

In Fig. 2 the colon is represented entirely surrounded by firmly adherent peritoneum, and having a comparatively short mesentery, and in such a condition that it is absolutely impossible

to reach it or to see the longitudinal bands without first opening the peritoneal cavity.

The ascending and descending colons were found to have a mesentery of varying length, according to Mr. Treves, in twenty-six cases out of one hundred on the right side, and in thirty-six cases out of one hundred on the left side. The author observed this in forty-nine cases out of sixty on the right side, and in fifty out of sixty on the left. The percentage is eighty-one and two-thirds cases out of one hundred on the right, and eighty-three and one-third out of one hundred on the left.

In Fig. 3 this condition of mesentery is much intensified, and the intestine, though it may rest in the loin, can so alter its position in the belly that when operating on either side it may lie on the side of the belly opposite to that in which the incision is made. It

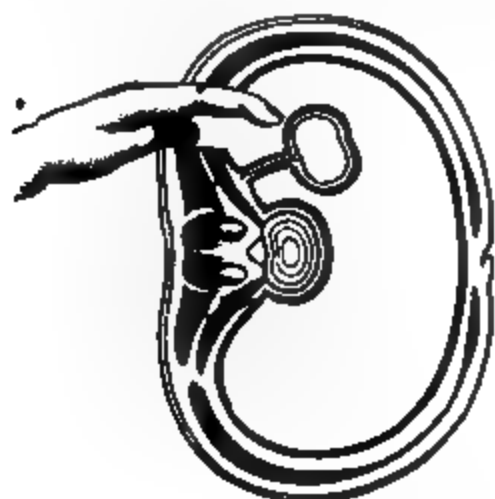


FIG. 2.
(*British Medical Journal.*)

FIG. 3.
(*British Medical Journal.*)

then, in the cases reported, was said and supposed to be impossible to find the colon from the lumbar region.

The last two examples show how imperative it is to make sure that it is the large and not the small intestine, or even the stomach, which is going to be opened. The presence of the appendices cecocolicæ may also inform the surgeon that he has found the large intestine, but these are not considered as important as the longitudinal bands, since they may not always exist on the piece brought to view.

Bearing in mind these anatomical facts, the question arises how they may be dealt with successfully.

In a case represented by Fig. 1, after exposing a piece of intestine and failing to see a longitudinal band, a small incision is made into the peritoneum, and by finding a band it is ascertained

that it is the large intestine. The posterior part of the intestine is then taken hold of, drawn to the surface of the wound (the gut being pulled out as far as possible so as to make a good spur), and carefully stitched with interrupted sutures all around to the edges of the skin, without perforating the mucous lining. The gut may then be left unopened for some hours, or, if necessary, opened at once, provided it is carefully attached at every point to the surrounding edges of the wound.

When the condition represented in Fig. 2 occurs, in the first place a sufficient search should be made for the gut about the subperitoneal connective tissue, under the assumption that it is in its normal position; but should this search fail, all the loose pieces of fat must be sponged out of the wound, and the peritoneum at the interior angle of the wound deliberately opened (and the edges clipped) just sufficiently to admit the index finger. This finger is passed toward the vertebræ, and then swept over the front of the kidney and quadratus lumborum, and the gut, though in the position shown in Fig. 2, can be easily felt, hooked up, and the longitudinal bands seen. The peritoneum is then opened to the extent of the wound and a sponge introduced with string attached, to keep the intestine out of the way while the cut edges of peritoneum are drawn up and sutured to the skin. This entirely shuts off the cut abdominal muscles from the peritoneal cavity. Occasionally this stitching is not easy to do, either on account of the depth of the wound or from the firm adherence of the peritoneum to the abdominal wall. The rest of the operation is completed in the usual way as described in the first class of cases. Here, if the mesentery be sufficiently long, a stitch may be passed through it, fixing it to the surface of the wound to form a good spur.

In dealing with the third position, as represented in Fig. 3, after proceeding in the manner described in cases one and two and failing to find the colon, the external wound should be enlarged forward and backward sufficiently to admit the hand. The peritoneum is next opened to a corresponding extent, and, having well cleaned the hand, it is passed into the abdomen. If it is the left colon that is to be operated upon, first pass the hand upward toward the spleen and feel for the splenic flexure. Then draw the hand down the intestine till the large piece opposite the wound

is found and brought to the surface. This piece must have the characteristic longitudinal bands.

After it is found it should be held with forceps that will not perforate it, and a sponge introduced to prevent prolapse of the small intestine, while the wound is treated as follows: At the anterior and posterior parts, if the wound is six inches long, two inches in front and two behind should be closed as in an ordinary abdominal section. But at the middle two inches, where the intestine is to be brought up to the surface, the peritoneum should be sutured to the skin, as described in the second class of cases, and the operation completed in the same way. In this third condition a good spur can and should be always made, and when the gut is opened its prominent edges ought to be cut away.

The writer does not at all advocate lumbar colotomy when it is possible to perform the inguinal operation, for the lumbar is certainly the more difficult, the patient runs greater risk and recovers less quickly, and the after results are not as satisfactory.

The writer does not emphasize the point which he renders so plain, that when the lumbar operation is performed with these necessary precautions to make sure that the colon is the part opened, it loses its only supposed advantage over the inguinal—the non-interference with the peritoneal cavity.

Cripps² gives the following minute description of the technique of the inguinal operation:—

The abdomen having been thoroughly well washed with soap and water, antiseptic treatment as regards sponges, instruments, hands, etc., is carried out. An incision two inches and three-quarters in length is made one inch and a quarter from the anterior superior spine, one-third of the incision being above and two-thirds below an imaginary line drawn from the anterior superior spine to the umbilicus. In making this incision the skin should be drawn a little inward, so that the opening through the transversalis fascia and peritoneum is on a different level when the skin is again relaxed, thus making the opening valvular and rendering its subsequent closure with a pad easier. The peritoneum being reached, it is pinched up and a small opening made, which is subsequently enlarged to nearly the length of the cutaneous incision. The small intestine generally first presents, but on pushing it back the colon often shows itself; if it does not it can be readily found

by passing the finger downward into the pelvis and following the rectum upward till the sigmoid flexure is reached, which can be hooked out with the end of the finger. With moderate care there can be no possibility of mistaking the small intestine for the colon. The three longitudinal bands are very conspicuous, which, together with the glandulæ epiploicæ and the regular convoluted surface, establishes unmistakably its identity. Not infrequently, moreover, hard, scybalous masses can be felt within it. A loop of bowel being drawn into the wound, two provisional sutures of silk are passed through the peritoneal coat opposite the mesenteric attachment. These provisional ligatures, the ends of which are six inches long, help to steady the bowel during subsequent stitching to the skin, and eventually serve as guides when the bowel has to be opened; they should be two inches apart. The bowel is now temporarily returned into the cavity. The parietal peritoneum is then picked up with forceps and attached to the skin on each side of the incision by a couple of sutures of fine silk, one inch and a half apart. The bowel is again drawn out by means of the provisional ligatures and fixed to the skin and peritoneum by six fine ligatures on each side. These sutures are best passed by fine, slightly curved needles, the needle passing first through the skin an eighth of an inch from the margin, then through the parietal layer of the peritoneum, and lastly through the peritoneal and muscular coats of the bowel, great care being taken to avoid perforation of its mucous membrane. It is easier to pass all the sutures before tying them up. The wound being perfectly cleaned by gentle sponging, the threads can all be tied with moderate tightness. A suture should now be passed through the skin at each end of the wound, including a portion of the peritoneal layer of the bowel. The ligatures should be passed not far from the mesenteric attachment of the gut, so that about two-thirds of the circumference of the bowel is external to the wound. He regards it as a waste of time to stitch the parietal layer of the peritoneum all the way round to the skin before drawing out the bowel. The four stitches mentioned are all that are really necessary at first to fix it, for it is subsequently included in the ligatures attaching the bowel to the skin. A piece of green protective is put over the exposed bowel, and the whole covered with a firm antiseptic dressing. Unless the protective is used it will be found that the

lymph thrown out from the bowel has attached the dressings with surprising firmness.

He dresses the wound the next day to make sure that nothing has been misplaced by vomiting, etc., the dressings being re-applied and kept on till the sixth day, when the bowel can be opened. By this time it is found firmly attached to the skin and covered by a remarkably thick layer of organized lymph. In opening the bowel the provisional threads which have been left in afford a valuable guide. They are gently drawn upon, and the bowel opened between them with a sharp knife. The cut margins of the bowel can be pared off with scissors to the level of its attachment to the skin.

No anæsthetic is necessary, the bowel being quite insensitive. The patient is convalescent in about three weeks. The author advises operating as soon as symptoms of stricture are apparent, calling attention to the slight risk when the operation is done early, while the mortality after signs of obstruction have begun is between 30 and 40 per cent.

CANCER.

The tendency of the year's work in excision seems to point toward more conservative treatment of cases of extensive disease. Kraske's operation, it will be remembered, ¹⁰²⁰_{24,2,76} consists, in brief, in making a median cut from the second sacral vertebra to the anus, severing the left gluteus maximus from its sacral attachment, excising the coccyx, detaching the sacral connections of the tuberosacral and spinoso-sacral ligaments, and chiseling away the lateral mass of the sacrum in a curved line which begins at the outer border of the third sacral foramen and terminates at the corner of the sacrum. The anus being next freed by a circular incision, the rectum is detached from its bed, the peritoneal cavity is opened also by a circular cut, the gut drawn well down and amputated above the tumor, and its end fixed by sutures to the para-anal tissues. The operation is completed by inserting a drainage-tube into the peritoneal cavity and plugging the rectum and wound with iodoform gauze.

In his first case the disease recurred at the end of four months. In seven subsequent cases by Kraske, three by Schönborn, one by Rinne, and one by Lauenstein the anus and lower

part of the rectum were spared, and about two-thirds of the anterior wall of the central end of the gut were united by sutures to the peripheral end, the posterior segment of the gut being left open for the escape of fæces.

Of these twelve cases six died—two of exhaustion, one of sepsis, one of peritonitis, caused by giving way of the sutures and the entrance of fæces into the peritoneal cavity, and one of iodoform poisoning. Of the six recoveries three had fistulous openings at the end of three, three and a half, and five months respectively; in two the healing was not complete till the end of six and eleven months respectively, and two were recorded at the end of one and three months respectively. In other words, of the entire number 38 per cent. died, and there is no record of any permanent cure.

The serious objection to this method seems to be that the peritoneal cavity is not closed and that contact of fæcal matter with the wound prolongs the healing process, favors septic complications, and results in the formation of a sacral artificial anus. To overcome these disadvantages Schede⁶⁹ describes three cases in which, after following the preliminary steps of Kraske, he introduced certain modifications. In the first case he attached the divided peritoneum to the serous surface of the sigmoid flexure, thereby closing the cavity of the belly, and left the anus, sphincters, and lower end of the gut intact, and secured it to the central end with two circular rows of sutures, of which the first included the mucous membrane and the second the other layers of the gut. The wound was dressed with iodoform gauze and opium administered to control the stools. The result was not wholly satisfactory. The ends of the gut did not entirely unite by primary intention and nearly a year elapsed before the complete closure of the fistulous track. The sphincters retained their function, however, and there was no difficulty from involuntary evacuations.

The great value of closing the peritoneal cavity is shown in two of Kraske's cases, in which it was omitted, though complete union of the divided ends of the bowel was attempted. In both instances the stitches gave way during a stool which occurred a few hours after the operation despite previous efforts to thoroughly empty the bowel and the subsequent exhibition of opium, and death ensued from fæcal extravasation and peritonitis.

The protracted healing in this case of Schede was due to con-

tact of fæces with the sutured bowel. Hence, in the other two operations immediately after resecting the rectum he made an artificial anus between the belly and the descending colon. In the first of these four-fifths of the rectal wound united by first intention and the remainder by granulation, while the other wound had closed in two months and a half. The artificial anus was then closed, and at end of four months from the primary operation the patient was discharged. The second of these cases followed a very similar course.

Considering the two methods together, the operation has been performed at least eighteen times with seven deaths—a mortality about equal to Bardenheuer's procedure of removing anus, sphincter, bowel, and tumor, opening the peritoneum, drawing down the divided gut and attaching it to the perianal tissues.

To those who hold that nearly all cases of rectal cancer are suitable for treatment by some modification of the operation of excision, Hildebrand's report³⁰¹_{Bd. 27, H. 2, 4} of the results of this work in König's clinic will not be encouraging. While it has been abundantly demonstrated that very extensive disease may be removed, and the technique of the operation has been so much improved that nearly any part of the rectum may be reached and extirpated rapidly, and with comparative safety as to the immediate result, the advisability of such treatment is further and further away from being established. The operations are done because they are manually possible and surgically justifiable, and by doing them only can the proper limits of operative interference be fully decided.

Hildebrand's statistics cover fifty-four extirpations in sixty-nine cases of disease, with a mortality of 35 per cent., which is much higher than might have been hoped. Moreover, exactly one-half of the mortality was due to infection, which only proves that no amount of asepsis or antisepsis can be relied upon with certainty to prevent periproctitis. Of those recovering from the operation thirteen died of relapse and five were suffering from relapse at the time of reporting; but three had lived three years, six over two years, and eight over one year without relapse. A point which is made very plain by this report is that, no matter whether the sphincter is or is not preserved in the operation, sooner or later the condition in all cases is one of incontinence or

else of cicatricial stricture. The result of Hildebrand's study is to convince him that inguinal colotomy is the proper treatment for cases of extensive disease; or, in other words, to place him in opposition to the tendency toward promiscuous operation at present prevailing among German surgeons. It would seem as though conservative ideas as to this matter were certain, after a time, to be accepted, and that operative interference must be limited by the extent of the disease and the amount of involvement of the strictures around the rectum, as has been upheld by me ever since the operation has been revived after having been for a long period in disrepute because its proper field of applicability was not strictly maintained. The simple facts seem to be that cancer of the rectum is less amenable to the knife than cancer of most other parts; that excision is followed by cure in a very small proportion of cases; that the dangers are great, and the results as to comfort very unsatisfactory; and yet that in properly selected cases—those seen early—much good may be done by operation, and in those seen late an astonishing amount of lower bowel may be extirpated without an immediately fatal result.

WOUNDS, INJURIES AND FOREIGN BODIES.

Dr. Achilles Nordmann,^{1, 11} of Basel, has published a description of twenty-five bowel lesions due to the administration of enemata. They include three complete perforations and ulcers and wounds of various depths and sizes. The causes of these wounds seem to have been the use of defective instruments, ignorance of the anatomy of the rectum, catching the transverse folds on the end of the tube, extreme irritation of the mucous membrane of the bowel, and obstructions caused by such conditions as a foetal head, an enlarged prostate, or a misplaced uterus.

As a rule, these lesions are to be found on the anterior wall from one to seven centimetres from the anus. They are not always easy to diagnosticate, as other foreign bodies or caustics may produce similar appearances. Tubercular or hæmorrhoidal ulcers may be mistaken for them. A perforating wound generally results in serious periproctitis, which may end fatally, or in stricture.

Thompson⁶ Des.^{3, 57} describes the case of a man, aged eighteen, who fell about four feet in a sitting posture on to the upright shaft of a smith's hammer, which he said entered his seat for a considerable

but unknown distance, and required some amount of force for its removal, which was accomplished by a fellow-workman. He had very little pain at the time of the accident, and walked about a mile to the infirmary without much trouble. On examination only some slight bruising was found around the anus, with a little blood-stained mucus. By the rectum nothing was detected. The abdominal walls were quite flaccid and the examination caused no pain. He complained, however, of a slight, continuous, aching pain just above the pubes. Soon after admission he passed both urine and fæces, the former normal, the latter soft and streaked with blood. Some hours later he passed another motion with a considerable quantity of clotted blood; the suprapubic pain also became more intense, but the abdominal walls still remained flaccid. The face was very pale, the pulse rather weak, and the extremities cold, but the patient appeared to be in good spirits, answered questions readily, and did not feel unwell. He remained in this condition till midnight, when the abdominal pain became more severe. Symptoms of collapse gradually came on, and he died at 8 A.M.

At the necropsy on the same morning the peritoneum was everywhere found intensely injected, and in part presented a thin layer of lymph. There was a marked laceration of the rectovesical pouch a little to the right of the middle line, caused by a triangular opening in the wall of the rectum about three inches from the anus. The triangle measured at its base one inch and a half, at its sides one inch. At the brim of the pelvis on the right side was a laceration of the peritoneum covering the psoas, with bruising of the subjacent muscle. The mesenteric glands were enlarged and inflamed. The abdominal cavity contained a small quantity of hard fæces. There was also found a piece of corduroy two inches long and one and a half inches in breadth, which corresponded to a rent in the patient's trousers.

Goodsall,² has had an experience of twenty cases of fish-bones in the rectum. He concludes that this form of accident is more common after the age of thirty-five; that a bone takes from one to nine days to traverse the alimentary canal; that the pain in the rectum comes on suddenly during defecation; that there is constant pain in the rectum, and often in adjacent parts, from the time of puncture till the foreign body is removed; that

the site of puncture is within the last inch of the rectum; that when abscess follows the puncture it begins to form within two or three days, but that when the case is seen early and the bone removed no ill effects are likely to follow the puncture; that when fistula has formed the patient may be cured by a free external opening, unless the internal one be large; that when it is necessary to lay open the fistula the wound heals much more rapidly after the foreign body is removed than in non-traumatic cases; that when the case is seen soon after the foreign body has punctured the rectum and before abscess has formed the patient should be etherized and the sphincter stretched; the body should then be removed either by the rectum or by external incision. The bowels should be confined for three or four days, and then moved by an enema of olive-oil.

Quénu,²² reports another case of spontaneous rupture of the rectum. The woman, aged sixty, of very weak constitution, had suffered for six years from prolapse of the rectum, which, however, was easily reducible. Being habitually constipated, she made free use of purgatives and frequently passed blood. For the last six weeks she had suffered more than usual and had kept her bed. The day of the accident she made great efforts at defecation, and suddenly felt something come down followed by great pain and loss of blood. A doctor who was called ordered her sent to the hospital, and when Quénu arrived he found the woman pale and cold, with a yard of intestine, black and shriveled, protruding from the anus. With a finger in the rectum a large rent by which the intestine escaped was felt in the anterior wall. Under chloroform, the abdomen was incised in the median line and nothing but blood was discovered. The prolapsed intestine was removed close to the anus, but all attempts to suture the rent were useless. Iodoform dressings completed the operation and the patient died on the next day. The autopsy revealed a rent an inch and a half long, together with a considerable number of varicose veins in the rectal wall.

The majority of these cases, as collected by myself,¹⁰²⁴ come from the monographs of Quénu and Englisch. This, I believe, is the first in which an effort has been made to suture the rent in the prolapsus through which the small gut has escaped by means of a laparotomy. The operation, in spite of this failure, still seems

feasible, and, I believe, will eventually be successfully accomplished under favorable conditions.

The possibility that an old prolapsus may contain loops of small intestine and may burst and allow of their escape should always be borne in mind, especially in operating upon the prolapsus.

N. Senn,⁹ in his report on the rectal insufflation of hydrogen gas in the diagnosis of intestinal wounds, reaches the following conclusions: 1. The entire alimentary canal is permeable to rectal insufflation of air or gas. 2. Inflation of the entire canal, from above downward through a stomach-tube, rarely succeeds, and should, therefore, be resorted to only in demonstrating the presence of a perforation or wound of the stomach and for locating other lesions in the organ or its immediate vicinity. 3. The ileo-cæcal valve is rendered incompetent and permeable by rectal insufflation of air or gas, under a pressure varying from one-fourth of a pound to two pounds. 4. Air or gas can be forced through the whole alimentary canal, from anus to mouth, under a pressure varying from one-third of a pound to two and a half pounds. 5. Rectal insufflation of air or gas, to be safe and effective, must be done very slowly and continuously. 6. The safest and most effective rectal insufflator is a rubber balloon, large enough to hold four gallons of air and gas. 7. Hydrogen gas should be preferred to atmospheric air or other gas. 8. The resisting power of the intestinal wall is nearly the same throughout the entire length of the canal, and in a normal condition yields to a diastaltic force of from eight to twelve pounds. When rupture takes place it either occurs in a longitudinal laceration of the peritoneum on the visceral surface of the bowel, or as multiple ruptures from within outward at the mesenteric attachment. 9. Hydrogen gas is devoid of toxic properties, non-irritating in contact with living tissues, and is rapidly absorbed from the connective-tissue spaces, and all of the large serous cavities. 10. The escape of air or gas through the ileo-cæcal valve, from below upward, is always attended by a blowing or gurgling sound heard most distinctly over the ileo-cæcal region, and by a sudden diminution of pressure.

PROLAPSUS, ULCERATION AND MECHANICAL OBSTRUCTION.

Mikulicz¹⁰²⁰_{Bd.17} recommends the following procedure for the removal of prolapsed rectum or intussuscepted colon in cases in

which such a plan of treatment is determined upon. In one case two feet and a half of prolapsed colon were amputated, the patient making a good recovery.

The patient is placed in the lithotomy position. Two strong threads are passed through the extremity of the prolapse and looped for fixation. Irrigation should be continuous throughout the operation. A transverse incision is made through the anterior part of the prolapse, going carefully through its thickness, all bleeding being checked. When the serosa of the intussusciens is cut through, exposing the serosa of the intussusceptum, the two serous membranes are stitched together with a circle of fine sutures, thus closing all communication with the peritoneal cavity. Just beyond the sutures the anterior part of the intussusceptum is also cut through and the two ends of the gut are then sutured together to the entire extent of the incision by silk threads, including all the coats of the bowel. The threads are left long and used to steady the bowel till the completion of the operation. Finally, the remaining periphery of the two intestinal lumina is secured, the numerous mesenteric vessels tied, and the union of the gut completed by the deep sutures. The line of suture is dusted with iodoform, the long ends of the sutures cut away, and what remains of the prolapse is reduced. No drainage-tube or bandage is used, and opium is given for eight days.

Under the heading of the "Surgical Aspects of Constipation," Warrington Haward⁶_{Apr. 28} deals with some of the affections of the rectum.

Case 1. A young and healthy man had been suffering from gradually increasing constipation for two or three years, the bowels acting every third or fourth day. During the last fortnight a fresh symptom had developed. Even when he felt a desire to defecate he had great difficulty in obtaining a passage, often giving up the attempt on account of the pain caused by the effort. The pain radiated from the anus, was severe enough to make him feel sick and faint, and lasted from one to three hours. After a dose of castor-oil the patient was anæsthetized and examined in the lithotomy position. When the sphincter had been dilated an oval ulcer was seen on the posterior aspect of the rectum just within the anus. The lower margin was slightly overlapped by a small fold of swollen mucous membrane. A knife with a rounded end

to the blade was passed a little beyond the limit of the ulcer and an incision made through its base about a quarter of an inch into the underlying muscular tissue, a strip of carbolized lint was introduced into the incision, and the patient put to bed. There never was any further pain.

Case 2. A woman who had suffered for some time with the usual symptoms of hæmorrhoids of moderate extent. After a certain action of the bowels she was attacked with intense pain, accompanied by sickness and faintness, lasting several hours. Two days later, while at stool, she was attacked with the same pain, so that she could not obtain an evacuation. On examination one of the small hæmorrhoids was found to be superficially ulcerated. A cure was speedily obtained by securing a soft daily motion and the introduction of suppositories of gray oxide of mercury and cocaine, with rest in the recumbent position.

Case 3 was one of pain and consequent constipation due to the presence of ulcerated hæmorrhoids. In all three cases advice was sought not because of constipation but because of pain, and in each instance the pain was due to ulceration of the rectum. They are all illustrations of a vicious pathological circle: for, firstly, the patients had all become constipated, the constipation led to ulceration, and the ulceration again to constipation. The pain in all was characteristic of ulcer of the lower end of the rectum, for not only was it very severe at the moment of defecation, but it continued for a considerable time afterward and was accompanied by intense spasm of the sphincter. Ulceration higher up the bowel does not cause this kind of pain; but wherever skin and mucous membrane join at the various natural orifices of the body there is a rich nerve supply and great reflex activity. Hence it is that an ulcer near the anus gives rise to a spasmodic resistance to the outward passage of the contents of the bowel and so keeps up constipation.

Two cases are related in which constipation depended on mechanical obstruction. 1. An infant five months old, suffering greatly from constipation and straining at stool. This was due to congenital smallness of the anus, which had not been noticed until, with the increasing age of the child, the motions became of sufficient firmness to pass only with difficulty. The anus looked natural at first sight; but when the buttocks were separated the

opening was seen to be funnel-shaped and narrowed to the size of a No. 4 catheter. With perseverance, however, the little finger could be introduced, and subsequently the forefinger, and by the use of daily dilatation the contraction was overcome.

In another case of a little boy, aged four, the increasing difficulty of defecation was the result of the contraction of the scar of a scald over the buttocks and round the anus, which he had received when eighteen months old.

In this case bougies of gradually increasing size were passed daily and retained in the rectum ten minutes, and thus, after every perseverance, the contraction was overcome.

Constipation is also shown to have a surgical bearing in relation to bladder and prostatic disease. In one case an old gentleman of seventy-five found himself unable to draw his water, as he had been in the habit of doing for years, because his bowels had not acted for several days and the rectum had become obstructed with a mass of hard fæces pressing upon the prostate. In young children, also, the function of the bladder is often interfered with by irritation from the rectum, and in these cases incontinence and not retention of urine results. Recently a little boy was sent into the hospital under the impression that he might have stone, but in whom the irritation of the bladder and incontinence of urine seemed to have depended entirely upon the presence of hard fæces in the rectum. Besides the mechanical irritation thus caused, children who suffer from constipation are apt to pass large quantities of uric acid, the presence of which in the urine often gives rise to incontinence. If we bear in mind the sensitiveness of the nervous system in children and the ease with which the temperature is disturbed we shall not be surprised at the serious symptoms to which constipation may give rise. These are conditions which come more often under the treatment of the physician; but in the surgery of children it is no less needful to take heed to the condition of the bowels.

ANTISEPTICS IN RECTAL SURGERY.

The universal acknowledgment of the value of antiseptic precautions in all surgical work has rendered the preparations for any operations upon the rectum much more elaborate than formerly.¹⁰¹ No surgeon meeting with an unfortunate result after

any of even the simpler operations would feel quite blameless had he neglected these precautions, and he certainly would not be considered so by the profession at large. What is true of the minor operations applies with much greater force to the major ones. The possibilities of diffuse inflammation, to which the perirectal cellular tissue is peculiarly liable, and of blood poisoning is always to be borne in mind and guarded against. For this reason, although I have never arranged a case of rectal instruments for operating (preferring to select those necessary for any particular case just before the operation and carry them rolled in a chamois in a small hand-bag), I have for greater convenience arranged another bag which is always ready, and contains not the instruments for any particular operation, but the things which in addition to them are essential for every operation. I find that much time and annoyance is saved by this expedient, especially if the bag is carefully re-arranged after each time it is used and kept always ready for the next. The bag is arranged on the general plan suggested by Dr. Gerster, modified to suit the particular needs of rectal surgery. It contains: 1. Operating gown of white muslin, clean from the wash. 2. Two rubber sheets. One of these is a yard square to protect the carpet and hold an ordinary wash-bowl, which can always be obtained in any house; the other is one and a half yards long by a yard wide, and is long enough to protect the bed and hang down into the bowl as a trough for blood and fluids. 3. Fountain syringe with a loop of strong cord attached to the metal ring at the top so that it can be hung on top of a door if nothing else is convenient, and plenty of rubber tubing to reach a considerable distance. This is for irrigating, and the bichloride solution is carried in a bottle provided with a metal case. If it is made of the strength of sixteen grains to the ounce, one ounce of the solution to the quart of water will make a solution of about one part to the thousand. 4. A Clover's crutch (Dr. Peter's modification). 5. Ether and inhaler. 6. Small bottle of pure carbolic acid (all glass bottles should be in metal cases to prevent breakage). Half an ounce of this to the quart of water poured into a shallow dish answers for immersing the instruments during the operation. 7. A small jar of carefully prepared sponges, each of which is thrown away after being used. 8. Long-handled sponge holders. 9. A rubber bag full of picked lint and bichloride gauze.

10. Iodoform in an insufflator with a long nozzle. This is much better than the hard-rubber sprinkling-box, with which it is very difficult to carry the powder within the rectum. 11. Bandages and suppositories. 12. Small graduate. 13. Vaseline or carboline. The things thus far enumerated are necessary for every cutting operation about the rectum, and although their preparation and use entail some little care and trouble, it will be more than repaid both in actual results and in the sense of security. The time was when all that was necessary for an operation for hæmorrhoids were forceps, scissors, and a string. As the above-enumerated things are necessary for a simple operation, and only a few others are needed for a much more extensive one, the latter can easily be added when required. These are: 14. A jar full of drainage tubes of various sizes kept in carbolic acid solution. 15. Bottles of catgut and silk sutures of all kinds. The silk may be kept in carbolic solution and the catgut in alcohol. A very convenient arrangement for these is made by fitting a rubber cork tightly in a large-sized test-tube and attaching to the cork a bobbin divided into three compartments for different sizes of ligatures. 16. A bell-shaped sponge with vulcanite tube and a bottle of dry subsulphate of iron for packing the rectum in case of hæmorrhage. 17. Hypodermic syringe. With this bag at hand the surgeon is ready for almost any emergency in rectal surgery. The cutting instruments, forceps, Paquelin cautery, écraseur, speculæ, artery forceps, etc., can be taken from their case and be ready for use in a very few moments.

In the use of antiseptics about the rectum and peritoneum the power of absorption possessed by the mucous and serous membranes must not be forgotten. Iodoform and bichloride of mercury must be used with special caution. Several cases of mild delirium following operations, which could be explained in no other way, have very justly been attributed to the free use of iodoform, and some of the mortality of Kraske's operation is distinctly stated as due to poisoning with this drug.

The Germans have an efficient way of applying an antiseptic dressing within the rectum and allowing it to remain for some days. It consists of a rubber tube half an inch in diameter, which is wrapped around with iodoform gauze and placed in the rectum, the gauze being in contact with the wound surface and filling the

canal. The upper end of the open tube projects beyond the gauze and the lower end is outside of the anus. Through the tube gas and fæces escape, and by the free use of opium such a dressing may be retained for one or even two weeks.

HÆMORRHAGE AFTER OPERATIONS.

This is an accident every operator should be prepared to meet at an instant's notice and to overcome. The procedure is equally simple and effectual. Pressure with cotton-wool and a pad and bandage against the anus should first be tried, and ice, or ice-water, may be placed in the rectum. These failing, and the patient continuing to evacuate large clots of fresh blood when the desire for a stool is felt, no time should be lost in half measures. A bell-shaped sponge the size of the closed fist, previously rendered aseptic, should always be in the operating bag. A hard-rubber tube of half inch diameter and six or eight inches long should be thrust through the apex of the sponge and firmly tied so that an inch of tube projects. Squeeze the sponge dry and freely dust with dry subsulphate of iron. Etherize the patient, introduce sponge and tube above the bleeding point, pack the rectum below the sponge down to the anus full with coarse charpie, pull down on the end of the tube and press up on the charpie, and a pressure is exerted on the lower rectum and anus which will be absolutely reliable. The compress may be left in indefinitely (a fortnight) and may be removed with ether.

AMPUTATIONS, EXCISIONS, AND PLASTIC SURGERY; DISEASES OF BONES AND JOINTS.

By P. S. CONNER, M.D., LL.D.,
CINCINNATI.

AMPUTATIONS.

General.—Page ⁶_{July 11} reports that at the Newcastle Royal Infirmary during 1887 sixty-two major amputations were made upon sixty patients, with fifty-eight recoveries, one death occurring two hours after double amputation (of thigh and leg), the other from gangrene present at the time of operation.

Spontaneous Amputation.—Thornton ¹⁰⁰_{July} reports a case observed in Nicaragua, following snake-bite. The stump presented the appearance shown in Fig. 1.

Robinson, in India, ²_{Vol. I, p. 171} saw a man in whom, in consequence of abscess of the left elbow, elimination of bones took place to such extent that fifteen years later, the individual being then forty years old, there was "not a vestige of the humerus, ulna, or radius to be felt in the arm." The case is beautifully shown on the next page (Fig. 2).

Multiple Amputations.—Wallace ¹⁹_{May 20} removed both forearms, the right leg, and part of the left foot, for frost-bite; Luckie, ²⁰⁰_{Aug} left thigh, right leg, and right arm, and, in another case, left thigh, right thigh, and right arm; Ashhurst, ¹⁹_{Apr. 27} right thigh, left leg, and right forearm; and Brokaw ⁸²_{Jan. 14} refers to a removal of both arms and one leg by a surgeon whose name is not given. Ashhurst, in reporting his case, refers to cases of triple amputations done by Kohler, Lowman, Stone, and one other surgeon. He advises in cases of grave injury that the carbonate of ammonia in two-to

FIG. 1.—SPONTANEOUS AMPUTATION.
(St. Louis Medical and Surgical Journal.)

five-grain (0.129 to 0.32 gramme) doses every two hours or oftener be given from the time of the operation, not alone for its stimulating effect, but to prevent the formation of heart-clot; and that special care be taken to keep up the temperature of the patient during the operation.

Amputations in Extreme Old Age.—Wharton¹¹² removed the leg of a patient over eighty, and the arm of one over eighty-four years old, recovery taking place in each.

Relative Frequency in Men and Women.—Marks¹ states that "out of a total of eight thousand six hundred and six cases

FIG. 2.—NATURE'S SURGERY.
(*British Medical Journal*.)

in which artificial limbs have been furnished, he finds the records of three thousand five hundred sufficiently full to enable him to make the following estimates: 85 per cent. of amputations are of legs and 15 per cent. of arms. Of legs, 49 per cent. are right, 46 per cent. left, and 5 per cent. both. Seventy-eight per cent. of amputations occur in males and 22 per cent. in females. In the latter, amputation of the right leg is more frequent than that of the left, and the proportion of double amputations in males is nearly twice that in females.

Local Recurrence of Sarcoma After Amputation.—At the

meeting of the Anatomico-Clinical Society of Lille, Duret ²²⁰_{Oct. 22} declared that before absence of local recurrence is affirmed, very minute examination of the stump should be made, as in cases of this sort there always exist neoplastic nodules in the medulla and the spongy cavities of the bone in the part preserved.

Painful Stumps.—At the late Tuberculosis Congress in Paris, Guinard stated that he had seen stumps in which the painful condition was due to tubercular deposits pressing upon the nerve-trunks above.

SPECIAL AMPUTATIONS.

Interscapulo-thoracic. — Adelman⁶⁹_{June 14} has collected the statistics of sixty-seven cases of the Berger operation, fifty of which were for new growths, twenty-four patients recovering and twenty-six dying. He advocates, as all must, early and thorough operation if any. Van Iterson⁹¹_{July 10} had a successful case of this kind. Bennett May³²_{Feb.} has reported at some length the case noticed in the last ANNUAL, and adds a second case. ³²_{May}

Shoulder.—To prevent hæmorrhage in those cases in which the loss of even a small amount of blood is dangerous, Koch ²²⁶_{Ed. 3, 6, H. 2} “advises that the clavicle be divided at the inner border of its outer third and, after a preliminary bandaging of the arm, a strong rubber tube be passed beneath the axilla, around the shoulder, and through this break in the continuity of the bone. Before knotting, four loops should be affixed corresponding to the position of the pectoralis, latissimus dorsi, clavicle, and spine of the scapula. The rubber tube is drawn tight and tied, and to prevent it from slipping when the arm is taken away the loops are pulled by two assistants toward the sound side of the body. By this means not only the subclavian but also the vessels which supply the collateral circulation are firmly compressed.”

Hip.—Diakanoff, of Moscow (corresponding editor), reports that Tcherniahowsky⁵⁸⁶_{No. 22, 34} adds to the statistics of this amputation six cases operated upon by Rinck, at Kiew, five of the patients being males, one female, aged twenty, twenty-three, twenty-three, thirty, forty, and fifty-eight years. Four operations were on the left, two on the right side; five were for sarcoma, one for osteomyelitis. One of the patients, the oldest, died twenty-three days after of senile marasmus. The others recovered, though one died of recurrent sarcoma of the left shoulder-blade twelve months

later. As a preliminary measure the external iliac artery was ligated in every case. In four cases the method adopted was a high circular amputation, with after-removal of the head of the femur through an external longitudinal incision,—a method which Tcherniahowsky prefers to all others. Successful operations are reported for osteomyelitis by Ustaviz and Garrard²_{v.1,p.200}; for sarcoma, by Pitts,⁶_{v.1,p.421} Walker,²⁰²_{p.200} Jackson,⁶_{v.2,p.213} LeBec,¹⁰⁰_{No.10} and Maynard,²_{Jan.28}; for “disease,” Page²_{v.1,p.100}; an unsuccessful one, death occurring in five days, by Trélat⁷³_{Nov.3,9}; and one for sarcoma, result unknown, by F. A. Humphry.²_{v.1,p.1200}

Thigh.—Nankivell⁶_{Dec.17,97} had a successful case of amputation of both thighs, upper third, for railway injury.

Gritti's Operation.—Wenzel,⁴_{Jan.16} strongly favors this operation, as giving a good stump, which cannot be conical, and has no wound-surface of bone beneath the flaps. Voigt¹¹³_{Mar.11} reports ten cases by Albert in eight of which there was union by first intention, and in the two fatal cases post-mortem examination showed that the bones had united.

Traumatic Separation of the Spine of the Tibia.—In a case observed by Godlee,⁶⁴⁵_{Sept.29} after amputation it was found that the spine of the tibia had been torn away, having attached to it the anterior crucial ligament and the external semilunar cartilage.

Knee.—Miller³⁶_{May} reports a case in which amputation was performed on account of a syphilitic gumma in the spine of the tibia, which had burst into the joint and caused disorganization.

Through Tuberosities of Tibia.—Dor¹¹⁹² strongly favors such operation, and thinks it should be preferred to the knee-joint amputation when it can be performed.

Leg.—Fuhr,³⁴_{June10} discusses at length the operations of Helferich, Mosetig, and Obalinski (referred to in the ANNUAL for last year). F. L. Puffer¹⁰⁵_{Mar.1} reports a case of amputation done on the thirteenth day after prolonged exposure to severe cold. For eleven days after such exposure the mouth temperature was 91° F. (32.77° C.). In an amputation above the ankle for traumatic gangrene by Walker,¹⁰⁴_{Feb.25} there was no hæmorrhage, and no ligatures had to be applied.

Ankle.—To prevent injury to the posterior tibial vessels and nerves, to lessen hæmorrhage, to render the stump more solid, and to secure, in some cases, re-formation of bone, Duzéa⁷³_{Apr.14} urges

the careful separation and retention of the periosteal investment of the os calcis. Dickson, of Pittsburgh,⁴⁶² in a paper read before the Ninth International Medical Congress, advocates much the same method of operating as had been described in 1881 by W. R. Hamilton, of Pittsburgh, and reports that in fifty-two ankle-joint amputations in that city death resulted in only three, twice from internal injuries and once from gangrene. Le Fort¹⁰⁰_{Sept. 25} reports a case of failure after the performance of his modification of the Pirogoff operation due to a late hæmorrhage, bone necrosing and having to be removed with the gouge. This he declares is the only failure he has had in twenty cases.

Osteo-dermoplastic Amputation.—For the relief of cases in which there is extensive ulceration on the lower and anterior part of the leg, Rydygier⁸_{Aug. 22} advises amputation by a long sole-flap, which can be brought up and made to cover in the ulcerated surface, provided that the ulcer does not extend down to the ankle.

Foot.—Cathcart,³⁶_{Mar.} in considering the question, “Should partial foot amputations be abandoned?” enters at length upon “an investigation into the part taken in the mechanism of walking by the various joints of the lower limb.” Holding that “physiology leads us to the least sacrifice of parts,” he approves of partial foot amputations. For the well-known objections to them on the part of instrument-makers and some surgeons, he finds explanation in (1) the occasional failure of these as of other amputations; (2) the erroneous views of the mechanism of the natural joints in walking; (3) the prevalence of faulty apparatus; and (4) the undoubtedly superior appearance of the artificial feet fitted on to amputations of the entire foot.

EXCISIONS.

General.—At the last meeting of the American Surgical Association, Ashhurst¹¹⁷² read a paper on excisions of the larger joints based upon personal experience in one hundred and twenty cases (shoulder, four; elbow, nineteen; hip, forty; knee, fifty-one; ankle, six). Of the patients operated upon, twenty-four died (elbow, six; hip, eleven; knee, five; ankle, two). The antiseptic method has been employed “for more than a year past, and I think with benefit, though I am obliged to say that, as regards the ultimate welfare of the patients, I have not noticed any gain.” Lucas

Championnière has lately declared that he regards "excisions as the best test of the antiseptic convictions of the surgeon. He who regularly secures perfect primary union in excisions of the larger joints may affirm that his antiseptic practice is irreproachable." Against routine excisions of joints, R. Jones¹⁸⁷_{July} strongly protests, in view of the fact that so often, under rest and appropriate treatment, useful limbs may be secured. Rochet,⁹¹_{Oct. 31, May} in a lengthy paper on "Dystrophies after Resections," holds that muscular atrophies after bone injury affect equally all the muscles of the part, the flexors as well as the extensors; while in atrophies of articular origin certain groups are specially disturbed, notably the extensors; and that the former are more slowly, the latter more rapidly produced. Dystrophies after excisions tend to improve, contrary to what is true of those after amputations. The great majority of them are due to conditions of the part prior to and which necessitated the operation. Even in traumatic cases serious damage to the nerves has been done by the injury, and oftentimes bad after-treatment has much to do with their production.

Because of the stripping up of the periosteum and disturbance of the adjacent soft parts that may occur in making an excision in the ordinary way, Ricard¹⁰⁰_{Apr. 7} urges the performance of subperiosteal osteotomy with after-removal of the epiphysis. In operations upon the shoulder, hip, elbow, knee, or ankle, Tiling³³⁶_{No. 4} advises chiseling off the muscular insertions and fastening them in place again after the capsule has been removed. He has performed the operation in eleven cases (elbow, two; hip, two; knee, five; ankle, two), but the reported results are not especially good. For the relief of those having joints useless and deformed as the result of infantile paralysis, Winslow¹⁰⁴_{Mar. 10} recommends excision of such joints and the securing of ankylosis. In a case under his care he excised the middle tarsal-joint and the left ankle-joint, ankylosis being secured in the foot but not in the ankle. Reference is made to operations performed by Lesser, Rydygier, and Vance.

Zinsmeister³³⁶_{Apr. 14} also urges the production of ankylosis in flail-joints and badly contracted ones, and names the operation *arthrodesis*. On ten patients Albert made fourteen operations, five at the knee and nine at the ankle. In eight of the patients the cause was infantile paralysis, and in two infectious disease. In a case

of Albert's, in which the shoulder had been dislocated nine times in fifteen months, operation was performed and ankylosis secured.

SPECIAL EXCISIONS.

Spine.—Duploux⁹¹_{Apr. 10} reported to the Congress of French Surgeons a resection of the transverse process of the axis, going down in the interspace between the sternocleidomastoid and the splenius.

Rib.—Cerné²⁰³_{Aug. 1} successfully removed the eighth rib with the associated costal pleura for osteosarcoma, the patient being a child.

The Temporomaxillary Articulation.—Küster⁴¹_{Apr. 12} presented to the last Congress of German Surgeons a report of four cases of excisions for ankylosis made during the previous three years, three by himself, one by Pauli, and considered at some length ankylosis of this joint, due either to (1) an affection of the lower jaw, *e.g.*, osteomyelitis; (2) purulent otitis following typhoid fever, measles, scarlatina; (3) general disease, rheumatism, arthritis deformans, tuberculosis, the latter seldom causing the condition. The ankylosed joint may present two conditions: (1) a true and complete ankylosis; (2) a condition in which the softer parts within the joints are destroyed, but a certain movement is left; probably a shrinking of the capsule is here present and accounts for the existing phenomena. All four cases mentioned had a "bird face." Some authors think the atrophy due to inactivity, but in one of the cases this is surely not the case, as the jaw, long before the disease began, was so small that the deformity must have been congenital. In other cases the atrophy is often greater on one side than on the other, which would speak against the "inactivity theory." The atrophy may be regarded as a trophic lesion due to disturbances in the nerves produced by infiltration of the soft parts. In operating, an incision is made beginning about one-half inch from the angle of the jaw and carried about three-fourths of an inch upward. The periosteum is split and peeled off and held back, and the bone chiseled through straight upward at the posterior border of the masseter, so that the operator enters the sigmoid notch. The mastoid process is then carefully twisted out. If there is ankylosis present the chisel is placed perpendicularly against the skull and driven on slightly and cautiously, owing to the danger of perforation,

and the bone loosened. This method has the advantage over Koenig's, being (1) easier, (2) quicker, (3) having a clear field, (4) involving no injury of adjacent parts; (5) the operation can be made subperiosteally; (6) a new mastoid process may form; (7) a much larger piece can be removed, thus tending to prevent recurrence of disease. But it certainly does not prevent relapse, as is proved by a case, and hence a longer after-treatment should be instituted. When both joints are excised, a thread should be passed through the tongue so that it can be drawn forward if symptoms of suffocation appear, as there is some danger of their doing.

Scapula.—Doll¹⁰¹_{July} has collected sixty-five cases of extirpation of the scapula for malignant growths and divides them into four groups: 1. Extirpation of the scapula with simultaneous exarticulation of the arm and usually also resection of a part of the clavicle. Total number of cases, seventeen. 2. Extirpation of the scapula with simultaneous resection of the head of the humerus (in one simultaneous resection of the acromial end of the clavicle). Total number, three. 3. Extirpation of the scapula with antecedent exarticulation of the arm. Total number, thirteen. 4. Extirpation of the scapula with preservation of the arm. Total number, thirty-two. The mortality was very high, nearly one-quarter of the cases dying soon after the operation. Most of the operations were performed without antiseptic precautions. Ceci is not far from the truth in assigning a mortality of 20 per cent. of all cases in which antiseptics were used. The proportion of definite recoveries amounted to 16.9 per cent., and it is worthy of remark that those cases in which the most radical measures were employed furnished also the largest number of lasting cures.

Clavicle.—Heath⁶_{Apr. 14} has reported a case of removal for sarcoma, the patient dying on the eleventh day, though the wound was found healed; and Bull¹_{Jan. 21} one of removal of nearly the entire bone for syphilitic necrosis.

Shoulder.—Excisions for disease of the head of the humerus following reduction of an old luxation with recovery of excellent motion is reported by Bellamy.⁶_{June 2} Hurd and Christian⁹⁶_{June} found, twenty-five years after operation for gunshot injury, that a large amount of voluntary motion was preserved. The appearance of the case is shown in Fig. 3. After an excision for osteomyelitis,

Quénu,⁹¹_{Dec. 10} finding symptoms still persisting, trephined the humerus above the elbow and passed carbolized water through such natural drain. The patient recovered.

Elbow.—Pitts⁶_{Nov. 2} has reported three successful partial arthrectomies in children. Sir William MacCormac stated that such partial arthrectomy “combined a minimum of operative interference with a maximum of good result, especially when the disease was limited to one part of a joint.” In a case of ankylosis following fracture, Vander Veer²¹⁶_{Oct.} successfully excised the outer condyle of the humerus. Le Bec¹⁰⁰_{Sept. 18} reports that in a case of osseous ankylosis (one hundred and thirty degrees angle) of ten months’ standing, in a child, aged thirteen, excision was followed by recovery with almost complete mobility of the elbow. In ankylosed elbows, Duzéa⁸_{Mar. 7} says that “partial, timid, and notably cuneiform osteotomies give the most deplorable results.” Ollier agrees with him.

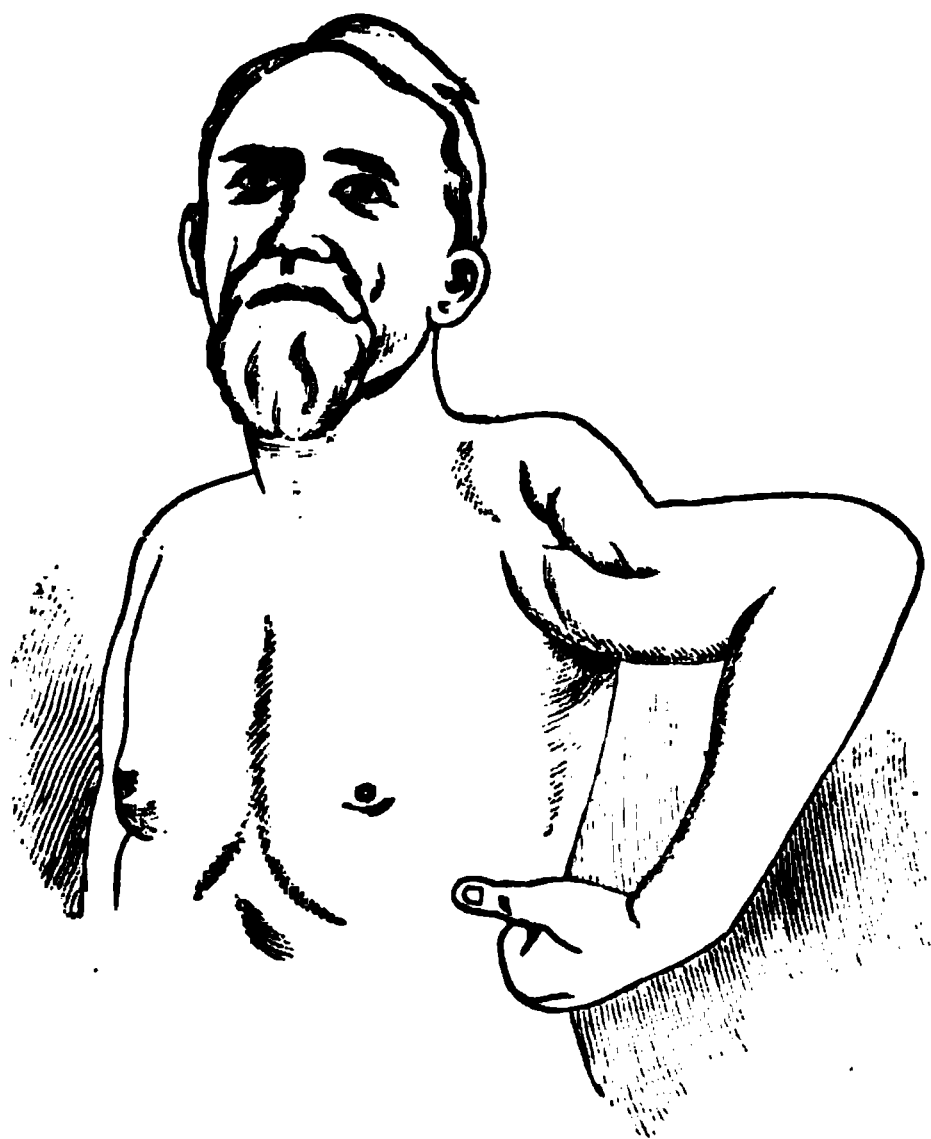


FIG. 8.—EXSECTION OF THE HEAD AND UPPER THIRD OF THE HUMERUS.
(*Annals of Surgery.*)

Forearm.—Kirmisson¹⁴_{Mar. 14} excised one and one-fifth inches of the radius and ulna a little above the wrist on account of rectangular flexion of the hand upon the forearm, the result of extensive destruction of the soft parts. Recovery took place with useful limb, though there remained some flexion of the hand.

Wrist.—At the last Congress of French Surgeons, Ollier⁹¹_{Apr. 10; Apr. 25} read a paper on excision of this joint for ankylosis, and reported two cases in which a successful result had been secured. Especial care must be taken to preserve the tendons of the wrist as well as of the fingers; and when the wrist is S-formed, the carpal bones must be literally carved out with the chisel and mallet, with great care not to wound any arterial or nervous trunk. In rheu-

matic patients, on account of a certain degree of tendinous ankylosis, a good portion of the bone must be taken away. The operation, if the trouble is not accompanied by tuberculous lesions, must also be absolutely without subsequent fever. Gangolphe declares that in these wrist cases the results are most satisfactory in patients between thirteen and eighteen years of age. Sendler³⁰¹ has reported two successful partial excisions of the wrist, and Scheffer¹⁰⁸

a case in which in a patient twenty-eight years old resection for tuberculous disease was followed by marked improvement of the condition of the lung.

Symphysis Pubis.—Helferich³²⁶ reported to the seventeenth Congress of German Surgeons that he had three times made partial excisions, once for tuberculous caries of the symphysis, once in a case of carcinoma of the bladder, once for enormous hypertrophy of the middle lobe of prostate, the patient dying in eight hours. The other patients were ultimately able to walk well.

Ilium.—Gussenbauer⁹ reports a recovery after removal of a large part of the right ilium for enchondroma.

Hip.—Ogston⁹⁶ reports five excisions in cases of old luxation, three congenital and two spontaneous, following non-suppurative inflammation. In one of these a new acetabulum was formed.

FIG. 4.—NEW ACETABULUM
AFTER RESECTION OF THE HIP-
JOINT

(*Annals of Surgery.*)

“A gouge was entered on the outer surface of the os innominatum, just above where the acetabulum should have been. It was thought better to do so there than at the site of the acetabulum, so as to avoid undue tension. The bone was easily pierced by the repeated removal of small portions. The opening was enlarged around its edges by the gouge until it was big enough easily to admit the point of the thumb. The projecting point of the femur was readily placed in it, and was found to remain there even on moderate flexion and extension. The child had no pain, even on

passive movement, and in seven weeks was walking about with a movable hip-joint. The bones seemed to bear on each other. The femur lay quite close to the pelvis, and could not be pushed in any direction, or to any degree out of its position. The deforming flexion and adduction at the hip-joint had quite disappeared. In aseptic operations, as for congenital or spontaneous dislocations, such a new articulation may with safety be made; but in resection for ordinary (tubercular) morbus coxæ, the danger of tubercular autoinoculation of the textures within the pelvis would be, I believe, far too great to justify its being attempted."

In a case of irreducible luxation of thirty-five days' standing, Bartha¹¹³_{May 13} performed excision and secured a functionally perfect limb. Cerné,²⁰³_{Oct. 1} in one of his operations, found the femoral head dislocated, and so firmly attached that he left a part of it adherent to the ilium. For arthritis deformans, excision was made by Zesas³⁰¹_{Oct. 27, p. 508} with the result of relieving the pre-existing pain, but leaving a limb too weak to sustain the weight of the body. Neudörfer⁸⁴_{Mar. 31} lays down the rule that in women excision should be made in all cases of ankylosis at such angle as to prevent intercourse, an operation that he has five times performed. Hahn is reported⁶⁵_{Aug.} to have eight times excised the head of the femur in cases of non-union after neck fracture. No death occurred, and useful limbs were secured. Two similar operations are stated to have been made by others. In his operations upon young children having hip-joint diseases, Weinlechner⁸⁴_{Mar. 31} states that he has never obtained good results, and that only one of his patients is still living.

Savirta¹⁴⁵_{No. 1} recommends, instead of the ordinary incisions, cutting down upon the upper postero-internal surface of the thigh, detaching the insertion of the adductor magnus muscle, reaching the foramen ovale, and then the femur, which is to be divided. This method of operating, it is claimed, affords ready access to the joint, and renders easy the examination of the cotyloid cavity. In the after-treatment of hip-excisions (which he holds should not be made for uncomplicated ankylosis) Ashhurst¹¹⁷² favors weight-extension and sand-bags.

Knee.—From Esmarch's clinic we have a report by Hitzegrad⁸⁴_{Sept. 8} of one hundred and fifteen excisions performed in the years 1874 to 1886 inclusive, one hundred and two for tuberculous

disease, nine for ankylosis, four for osteomyelitis, rheumatic polyarthritis, suppurative inflammation, and shot-wound. Of the tubercular cases in children, the greater number were synovial, not osseous (60 to 40 per cent.), in adults osseous (56 to 44 per cent.). Of the whole number of cases operated upon seventy-three recovered perfectly, eleven after secondary amputation, twenty-four recovered with fistula, one after secondary amputation, and six died (five after resection, one after amputation). The best results were in children. The average time of healing was eighty-five days. Of sixty cases followed up for a period of from two to five and one half years, in 90 per cent. the limb was useful, in 9 per cent. of little value. In one case fistula was present at the end of two and one-half years. In three cases there was motion. In thirty-four cases the leg was straight, in eighteen at an angle of one hundred and thirty-five degrees. Genu varum was present in one case, valgum in three. It is hoped that in the future the angle may be prevented by more exact and broader apposition of the bone ends, and long-continued irritation to stimulate bone-growth; such irritation to be made by large steel needles thrust into the bone and left for five weeks; in children, by keeping on for years a properly made support. That a good result may be secured, there must be complete removal of the diseased tissue, which can only be done when the field has been rendered bloodless by the application of the Esmarch bandage. With a single exception there was in all cases shortening and retardation of growth proportionate to the amount of bone removed, and in that case after several years there was shortening and an angular deformity, on account of which a new resection was made.

Ollier's total resections up to July last ²¹¹_{Aug. 5} numbered fifty, of which fifteen resulted fatally, fourteen out of twenty-four prior to 1885, one out of twenty-six since that time. He does not favor early excision except when conservative treatment has failed. Operations other than excisions in adults he regards as dangerous and ineffective. Long deferring of the first dressing is strongly advocated; as it is also by Duzéa, ⁹¹_{July 10} who advises that the limb be not redressed, even though the temperature be high, so long as the patient does not suffer locally and is in good general condition. In one of Ollier's cases the first dressing was left fifty-two days, in another fifty-four days, and in a third seventy-one days. Osseous sutures

passed through a tube and fixed by compressed shot are recommended to be used. When re-dressed, small drainage tubes of cat-gut or decalcified bone may, according to Duzéa, be substituted for those originally introduced.

Mollière²¹¹_{Oct.21} agrees with Ollier in the advisability of deferring the first dressing for a long time.

Prior to the 28th of March, Lucas-Championnière had performed twenty-one excisions without a death, twenty being for tubercular disease. Shortening he regards of advantage, as enabling the patients to walk with less difficulty.

In a case reported by H. Lee,⁶_{Apr.24} twenty years after excision, locomotion was good, though there was a shortening of nine inches, and in another case in which after eleven years there was six inches shortening the patient walked well, the to-and-fro motion was perfect, and there was no lateral motion.

In two cases reported by Bartha¹¹⁸_{May 13} the leg operated upon grew faster than the sound one, so that the original shortening was reduced more than one-half. In one of Esmarch's cases lengthening to the extent of one and one-fifth inches occurred during the first two years, but later there was shortening.

That a flail-like condition after excision may be corrected by a second operation is shown by the result of the case reported by Fisher,⁶_{Dec.24, '97} in which firm union was secured and the patient had a useful limb, notwithstanding a shortening of seven inches.

Whitehead,⁹_{Nov.24} in two cases of angular ankylosis, made partial excisions, cutting away enough bone to permit of the limb being straightened, taking care "not to divide the external lateral ligaments, or any other ligaments about the joint." The results were satisfactory. The appearance of the knee is shown on page 14 before and after the operation.

As a substitute for excisions, *arthrectomy* has during the year much engaged the attention of surgeons, especially in England, where it was made the subject of a paper read before the Harveian Society by Page,⁶_{Nov.17} and one before the Medico-Chirurgical Society by Owen⁶_{Nov.17}; of a clinical lecture at St. Thomas by Clutton,⁶_{Apr.21} a paper by Sheild,⁹⁶_{Feb.} and communications by Pollard,⁶_{June 16} Rook,²_{Sept.1} Wright,²_{Nov.24} and others. As claimed, it can and probably will be had recourse to at an earlier period than excision; is a less serious operation; saves the healthy parts; is recovered from quicker; is

followed by little or no shortening; and leaves a more useful, perhaps movable joint. Generally ankylosis will follow and in most cases nothing will be gained by attempts at securing movement, though Sendler³⁰¹ advises that such attempts should always be made with at least one knee if both are tuberculous. He concludes his article by declaring that: "1. A movable joint is to be preserved (*a*) after puncture and simple arthrectomies; (*b*) in all partial arthrectomies in cases of local synovial tuberculosis. 2. The



FIG. 5.—PARTIAL EXCISION OF THE KNEE.
(*Medical News.*)

attempt to preserve the mobility of a joint is justified (*a*) after arthrectomies in cases of synovial tuberculosis, if of not too high a grade, and without involvement of bone; (*b*) in the lighter forms of tuberculosis, even if small pieces of bone have to be removed; (*c*) at least on one side where there is tuberculosis of both knees. 3. Ankylosis with the knee extended is to be attempted (*a*) in severe general synovial tuberculosis; (*b*) in the grave ossific varieties. 4. The line of incision for the opening of the joint depends upon the result desired. If mobility is to be preserved, it is neces-

sary to select a method that will not interfere with continuous and efficient extension; but if ankylosis be desired, it is best to select that method which is most convenient in each case." In three of his cases movable joints were secured, and in two of the three the operations were made on both knees.

Vincent,²¹¹_{Feb.20} favors the thorough use of the actual cautery after the joint has been opened and scraped, and has found that there is no shortening (on the contrary, at times actual lengthening, even to the extent in one of his cases of over two and one-fourth inches), no muscular atrophy, and often retained mobility.

Boeckel,⁹¹_{Apr.10} who has performed twelve arthrectomies of the knee, all successful, though two patients later died of lung phthisis, favors the operation upon adults, as the mortality is less, though a longer period is occupied in the healing. In children he prefers excision. In his cases there was a mean shortening of one and one-fourth inches after two and one-half years. Lucas-Championnière, with the majority of French surgeons, regards excision as the better operation, being more thorough, no more dangerous, and more quickly recovered from. When only the synovial membrane is removed, Ollier names the operation synovectomy, rather than arthrectomy.

Leg Bones.—Rédard,⁹¹_{Apr.10} has reported resection of two inches of the tibia for vicious and painful union after fracture in a patient seventy-five years old. The entire shaft of the fibula was removed by Kirmisson,³_{Nov.7} for suppurative osteitis, careful examination showing entire absence of tubercle. For rachitic curvatures, Busachi,¹¹_{Aug.22} has made forty-six osteotomies, thirty-seven upon the femur, nine upon the tibia. Only "one patient died, probably of fat-embolism, eleven weeks after the operation." In an osteotomy for this cause made by Fisher,⁶_{Nov.3} a subnormal temperature of 94.2° was on one occasion observed.

Ankle.—Cabot,⁹⁹_{Mar.22} presented to the Boston Society for Medical Improvement eight cases of excision of the ankle in children, in which at periods varying between one and seven years "the joints were all solidly healed and free from tenderness or swelling," and in only two were there deviations of the foot, and these but slight. He regards the operation as a very satisfactory one in children, all the affected bones of the foot being removed and as much as possible of the leg bones saved, for the reason that

(1) interference with the epiphysial cartilage checks future growth of the limb, and may unnecessarily add to the shortening, and (2) the malleoli, when they can be preserved, add greatly to the strength and steadiness of the new joint. The shortened foot falls in between them, and they give it much lateral support. It is, therefore, better, when possible, to thoroughly scrape out the diseased tissue in these bones and not, except in extreme cases, to saw off the ends evenly." Lateral incisions were made, iodoform used, and the parts kept immobilized for several months after the joint was apparently soundly healed. Bradford, in the discussion upon these cases, expressed a high opinion of Kocher's incision, *i.e.*, a curved one under the external malleolus backward to the external border of the tendo Achillis, the divided peroneal tendons and lateral ligaments being later united by suture. Lister and Chauvel have reported cases of excision for badly united Pott's fracture, and Kirmisson one for deformity and ulceration following a burn. In this latter-mentioned case the external malleolus was saved.

Berger, ⁵⁰_{Aug. 18}, in a case operated upon for tubercular disease, prevented outward bending of the foot by the insertion of an ivory peg, which was removed two months later.

Osteoplastic Resection (Wladimir-Mikulicz Operation).—In addition to the twenty-four cases reported a year ago, fifteen have been put upon record, three by American surgeons, F. H. Gross, S. Smith, and McBurney; and papers have been published by Zoege-Manteuffel, ²¹_{Jan. 21} Butz, ²¹_{Aug. 18} Bauerhahn, ³⁰¹_{Ed. 27, p. 424} MacCormac, ²_{May 1} Stephen Smith, ⁹_{Mar. 17} and F. H. Gross. ⁹_{Oct. 27} The operation evidently has a place, though a limited one; but its real value, as contrasted with ordinary extensive excision and amputation, is yet to be determined.

Lawson, ²_{Jan. 20} remembers a case of Symes before 1870 which was "an identical operation, the foot and leg exactly resembling that figured by Sir William MacCormac."

Tarsometatarsal.—In removing the bases of the metatarsal bones and adjacent part of the tarsus, Gritti ⁵⁰⁵_{No. 2} advises an H-shaped dorsal incision after suturing of the bones and divided tendons. In a case thus operated upon (girl, aged five), after fourteen months the foot was found to be one and three-fifths inches short and the sole somewhat flattened. The child was able to walk very well.

Hammer-Toe.—Terrier ⁹¹_{Aug. 10} reported to the French Society of

Surgery three cases successfully treated by cuneiform resection performed by Bruno Chaves and himself. Terrillon stated that he had had five cases, making, according to Terrier, fourteen cases in all, and all successful.

Bunion of the Great Toe.—Armstrong⁷⁴ reports two cases of valgus hallucis treated by excision of the head of the first metatarsal bone, and regards the operation as “free from danger or difficulty.”

DISEASES OF BONES.

Alterations after Destruction of the Medulla.—Diakonoff, of Moscow, corresponding editor, reports that Wassilewsky¹¹⁹⁴ has broken up the medulla in dogs and rabbits by means of iron wire introduced through openings made in the length of the bone and upon its articular surface. As a result, he has found that there is produced but little irritation of the osseous tissue or the periosteum; that new bone is formed in the medullary canal independently of the periosteum; that the bony wall becomes more or less porous; and that the periosteum produces bone only in those cases in which the osseous wall has been pierced.

Effect of Tension.—In the interesting lectures upon “Tension,” delivered by Bryant,⁶ it is declared that: 1. The pain associated with every form of inflammation of the bone or of its periosteal covering is due to tension, and the severity of the pain is a fair measure of its intensity. 2. In acute inflammation of the bone or of its periosteum, tension is the chief cause of necrosis; and in the subacute and chronic forms it is a potent cause of their chronicity, as well as of the destructive changes which, as a rule, follow. 3. The relief of tension, wherever met with, when the result of inflammation, is an important principle of practice which should be always followed. In bone the principle is most imperative, on account of the difficulties under which natural processes act in that direction, by reason of the absence of elasticity or yielding in bone, and by reason of the anatomical arrangements of its vessels which favor blood stasis. 4. To relieve tension in the softer tissues of the body, the local application of leeches, local venesection, acupuncture, aspiration, punctures, and incisions may be requisite; whereas, to carry out the same practice in endostitis or periostitis, subcutaneous or open incisions down to the bone, and the drilling, trephining, or laying open of the bone by a saw, may be required,

the choice of method having to be determined by the requirements of the individual case. 5. In the early or hyperæmic stage of inflammation of bone, before destructive changes have taken place, experience seems clearly to indicate that the relief of tension, as indicated by a dull, aching pain, etc., by means of drilling or trephining into bone, may arrest the progress of the disease, and help toward a cure by resolution; whereas, in exceptional cases in which this good result does not take place, suffering is saved and destructive changes are limited. 6. In articular osteitis of every kind and variety and in every stage, this mode of treatment cannot be too strongly advocated, as tending toward the prevention of joint disease. 7. In acute or chronic abscess of the bone, diaphysal or epiphysal, the abscess-cavity must be opened as any other of the soft parts, drained, and dressed in the most appropriate way, the principles of treatment being entirely the same in hard or soft tissues, although they are modified by the anatomical conditions of the parts.

Necrosis.—Twynam,²_{Jan. 28} reports from Sydney, N. S. W., a case of necrosis of the femur, the result of "caisson disease," there having been, it is thought, an extravasation of blood in the affected bone.

To facilitate the removal of a large sequestrum through a small "button-hole" opening, Chicken,²_{Mar. 3} has devised a cutting bone-forceps which readily divides the bone.

Osteotuberculosis.—In three lectures before the Royal College of Surgeons, Barker,²_{June 9} has considered at length the nature of the tubercular disease, its modes of extension, the local changes produced, and the treatment which should be adopted, urging that early and thorough operations should be performed.

Early in the year there appeared in book form the seven lectures delivered by Lannelongue on "Vertebral Tuberculosis," a most valuable contribution to the literature of the subject. In Kocher's wards at Berne,²_{June 29} the inoculation of guinea-pigs has been employed as a bacteriological test of the existence of tubercular disease, such animals being very susceptible, and the development of the affection in them being rapid enough to permit of a positive diagnosis being made in from two to four weeks. "From the results obtained in one hundred and twenty cases where this diagnostic inoculation was practiced, from one to five

animals being used in each case, Tavel lays down the following propositions: 1. If the case is of tuberculous nature inoculation invariably gives rise to the development of tuberculosis in the animal experimented upon. 2. The method requires far less time and trouble, and gives more trustworthy results than microscopic examination. 3. The method is certain, even where anatomical examination is practically impossible."

Vance²²⁴_{Aug. 18} advises the use of the exploring needle in detection of existing bone disease, holding that no damage can result if the bone is healthy, and that if it is diseased the puncture cannot materially affect the case.

Fikl⁸⁴_{Jan. 7} successfully employed the Freund-Kölischer solution of the acid phosphate of calcium in a case of caries of the patella and tibia; he prefers applying it on gauze packed in rather than by injection. By Ceccherelli tannin is regarded as much superior to iodoform as a local application. Landerer³⁴_{Oct. 2, 9} advises the use of the balsam of Peru emulsion injected into the tuberculous bone or joint. Verneuil,¹⁰⁰_{No. 10} in a clinical lecture upon "Post-Operative Treatment," urges attention to hygienic measures and residence in a non-tuberculous atmosphere.

Location.—Barling⁶_{Mar. 31} has twice observed the disease in the bones of the skull; Cooper²⁸¹_{May} in the fourth and fifth cervical and first dorsal vertebræ when there was no tenderness on pressure nor other sign of disease; Faure⁷_{Mar.} in the posterior surface of the eleventh and twelfth dorsal and the lumbar vertebræ, the anterior surface being healthy; Pollosson²¹¹_{May 20} centrally in a costal cartilage in a patient seventy years old, primary cartilage-tuberculosis being very rare; Potherat⁷_{July} in the forearm of a twenty-year-old patient who, because of the existing good general condition and his physical vigor, was thought to be affected with osteomyelitis. Schmalfluss,⁶¹_{Apr. 21} analyzing the statistics from Maas' clinic at Würzburg, found that of nine hundred and seventy-eight cases observed during ten years 23 per cent. were of the knee-joint, 19 per cent. of the ankle and foot, 16 per cent. of the hip, 9 per cent. of the elbow, and 7.5 per cent. of the spine. Gangolphe²¹¹_{Mar. 20} calls attention to the fact that a limited tubercular affection of an epiphysis may be associated with an extensive one of the shaft, the exterior of which shows no signs of the existing internal lesion. Sheild⁶_{v. 2, p. 308} stated, at a meeting of the Pathological Society of London, that in

spinal caries paraplegia was not infrequent when abscess was not present, or at least apparent, while, when suppuration was present, it seldom occurred.

Sacroiliac Disease.—In a paper read before the American Medical Association, Van Hook,⁹ proposed: 1. Hygienic and symptomatic treatment, with counter-irritation by means of the thermocautery where pain exists or where improvement is slow, combined with complete mechanical rest, aided by extension in all cases where abscesses have not formed. 2. Subjecting at the earliest practicable moment cases exhibiting abscesses to a thorough radical operation by curetting performed posteriorly—that is, directly—when the abscess is extrapelvic in origin; performed anteriorly whenever the abscess originates within the pelvis.

Pelvic Disease.—Terrillon,¹⁹ points out the fact that in early life, up to about thirteen years, this inflammation is always located at the centre of the bone, in or around the cotyloid cavity, while in older patients it develops in the peripheral parts near the secondary centres of ossification. He urges early operation (simple aspiration at times suffices) to prevent involvement of large areas and the burrowing of pus, which he has seen travel as far as the neighborhood of the popliteal space. If the disease is already extensive the pus-channels should be opened up and as much bone removed as is diseased or can be taken away.

Osteomyelitis.—Having observed two cases of multiple recurrent subacute disease in workers in mother of pearl, Rubinstein,⁶⁹ has made it the subject of an inaugural dissertation. He states that the affection never occurs in children and is unattended by fever, and is to be treated by removing the patient from the pearl-dust atmosphere, applying heat, giving the iodide of potassium, and using the mercurial ointment locally. In an infant only two months old, under Reverdin's care,¹⁹⁷ the general condition was quite good,—due, as believed, to the state of the bone in so young a patient and the consequent absence of "tension." In a child nine years old, in whom the disease affected the neck of the femur, Macnamara,² made free incision on the fifteenth day and kept the parts thoroughly drained. After recovery the movements of the hip-joint were found to be perfect. Early and thorough drainage in such cases is strongly urged. Attention is called by Albert,¹¹⁸ to the liability to relapses, due either to renewed action of previously

encapsuled organisms, to abscesses occurring in the vicinity, or to new infection from without.

Cases occurring in adults were reported to the Society of Surgery, Paris, ³_{Feb.} by Augier, Berger, Bouilly, Le Fort, and Trélat. By most of those taking part in the discussion they were thought due to long anterior disease, though Lannelongue declared that primary osteomyelitis in adults is not so very rare. Dumoret, ⁷_{Jan.} presented to the Anatomical Society of Paris a tibia from a patient in whom there was such rapid enlargement of the leg and the general condition was so bad that malignant disease was suspected.

Among the complications are reported great thickening of the innominate bone, the femur being the seat of the disease (N.Y. Surg. Soc.), ¹_{Jan.}; frank pneumonia, pleurisy, and pericarditis in a nine-year-old child (Etienne, ¹⁸⁴_{Jan. 16}), and secondary infections of liver, spleen, kidneys, and heart (Potherat, ⁷_{Jan.}). Bauer, of St. Louis, ¹²⁴_{Apr.} in a clinical lecture, declared his non-acceptance of the "infection theory."

Hyperostosis.—A case affecting the bones of the face and head (leontiasis ossea) in a child twelve years old, who in early childhood had had rickets, is reported by Fränkel, ⁴¹_{Oct. 16}. The iodide of potassium was given in large doses, but without effect. Lane, ⁶_{Apr. 28} thinks that the hypertrophy of the skull in mollities ossium, osteitis deformans, rickets, and hereditary syphilis is "mechanical in its causation, being dependent upon and remedial of the softening which precedes it."

Exostosis.—Meunier, ⁷_{Jan.} presented to the Anatomical Society of Paris a femur upon the anterior middle third of which was an exostosis six inches long, broad at the base, and running to a point. Favier, ²⁴³_{May} in a paper on "Riders' Bone," advises the removal of such if it is very painful. Guende, ⁴⁶_{Apr.} presented to the Medical Society of Marseilles an exostosis of about the size of a foetal head attached to the postero-external surface of the left tibia of a woman, aged forty.

Osteitis Deformans.—Southam, ⁹⁰_{May} has reported a case presumed to be of rheumatic origin. Hutchinson, ²_{Dec.} directs attention to the many resemblances to some forms of tumors and to lupus, and suggests the hypothesis that it is "an infective malady in which one bone originates the elements which sets the process going in the others."

Osteomalacia.—In three cases Fehling⁹⁰_{Oct.} has removed the ovaries, and recommends such operation in the non-pregnant state and Porro's operation when the uterus is gravid. Oppenheimer⁸_{Aug.} states that 91 per cent. of osteomalacia is in women, 70 per cent. in those pregnant. He did Porro's operation upon a patient, forty-four years old, who recovered and was cured of the osteomalacia. Kobler⁸_{Aug. 30} reports a "rheumatic" case in a woman, twenty-eight years old, which proved fatal in one and a half years. The skull-bones were as transparent as paper, and could be cut with a knife. He notices also the great increase of sulphuric acid (16.04 to 6.85 per cent.) and decrease of sodium (9.35 to 23.17 per cent.) in the blood. Burgess⁹⁰_{Oct.} reports a case in a man twenty-one years old.

Cyst.—Bryant⁶_{June 22} reports a case located in the tibia, cured by trephining.

Angioma.—Nauwerck²⁰_{June 5} has met with a case of central hyperplastic capillary angioma of the lower end of the femur, which was mistaken for aneurism and the limb amputated. The specimen showed that the vessels were lined with cylindrical epithelium,—a condition before undescribed.

Sarcoma.—Lynch,²_{Mar. 21} and Edes⁶¹_{Apr. 20} have reported cases affecting the vertebræ, from the sixth dorsal to the sacral, and in the lumbar region. Edes insists upon the diagnostic value of the extreme and continued pain experienced in turning over or sitting up in bed, while at the same time the patient is free from fever. For sarcoma of the ilium, Gussenbauer¹¹³_{Jan. 22} removed a wedge-shaped piece of bone, the patient recovering with complete use of the legs.

Dennis,⁹_{v. 1, p. 20} in a lengthy paper on sarcoma of bones of the lower extremity, insists upon the removal by amputation of the entire bone affected, with, perhaps, the exception of the femur when the disease is central and located in the condyle. Valet⁷_{Feb.} showed to the Anatomical Society of Paris a specimen of two consolidated spontaneous fractures in a sarcomatous tibia. Sands,¹_{v. 5, p. 70} at the Roosevelt Hospital, amputated the thigh of a child, nine months old, for periosteal sarcoma of the tibia—recovery. Prengreber⁹¹_{May 10} operated upon a child, eleven years old, for sarcoma of the tibia, fifteen days after the apparent commencement of the disease, the diagnosis being based upon histological examination after an exploratory incision. Cancer of the hyoid bone was observed by Le Dentu¹⁴_{June 17} in a patient seventy-one years old.

Syphilitic Disease.—Sturgis⁵¹_{Apr.} has written at considerable length upon the occurrence of this disease in children. He holds that the joint is often affected; that in early infantile life osteitis occurs, later periostitis, which is less serious and less destructive; and that, while this disease may be an occasional cause of rickets, it is not the constant one. As affecting the fingers, Eschle²²⁶_{Ed. 36} concludes that: 1. Not only gummatous new formations in the medulla of the bones of the fingers and periosteum lead to the changes comprised under the name syphilitic dactylitis, but also gummata arising in the soft parts through indirect implication of the former tissues. 2. Nothing contradicts, in his cases, the assertion of Lewin, that in children the osteomyelitis, in adults the periosteal form of dactylitis, predominates. 3. In syphilis (only congenital?), hereditary influences may play an important part in the predilection for a certain form of symptoms and their localization. 4. Dactylitis seems to affect especially those who are run down and badly nourished, and those who have a tendency to scrofula or tuberculosis. 5. The prognosis is bad. The obstinacy of the affection may lead to disability, with loss of the finger. It occasionally indicates so grave a form of syphilis that other complications arise which endanger the life of the patient. Gummatous osteomyelitis, according to Gangolphe,²¹¹_{Jan. 20} as a rule, involves the greater part of the affected bone, produces deformity from irregular eburnation, and is unattended by the formation of pus, or of sequestra, notwithstanding the intensity of the pathological process.

Periostitis.—Schlange²²⁶_{Ed. 36} reports four cases of albuminous periostitis in addition to eleven previously observed by different surgeons. All of the patients were young, between fifteen and twenty years old. There was no pus, but a serous or synovia-like fluid with evidences of inflammation in or around the bone. He regards the disease as a form of acute purulent osteomyelitis of less intensity than that ordinarily seen. As already shown by Riedinger, it has no connection with bone-tuberculosis. It may, and ordinarily will, be mistaken for some other variety of bone or joint disease, its real nature being discovered only upon puncture or operation.

Barie³_{May 30} states that variolous periostitis has not often been reported. It comes on during convalescence and most often in young persons; may be limited or affect several bones; attacks by

preference the tibia; pain and swelling are present, but no fever; it terminates favorably, but relapses may occur.

Martha¹⁵²_{Apr.4} reports two cases of osteoperiostitis after typhoid fever, in one of which there was later much atrophy of the leg and interference with standing and walking.

Pseudarthrosis.—Pétel²⁰⁸_{Apr.1} had a case in which after resection and wiring of the fragments of the humerus consolidation did not take place before twenty-one months. Albert has used silk sutures.

Tillaux⁹¹_{Apr.10} regards non-union as ordinarily due to interposed muscle, destruction of the fibrous band being the essential thing in the operation. He favors simple scraping of the fragment ends and thinks that sutures are useless. Le Fort has four times used electricity, three times with success. Labbé, also, has successfully employed it.

BONE GRAFTS.

In a paper read before the San Francisco Medical Society Sherman⁷⁷_{Jan} reported two cases in which he had used animal bone grafts upon the tibia. The pieces, one-third by one-fourth inches, were taken from young dogs and chickens, but the former were found to be much the better. The results were considered quite satisfactory. In the discussion upon this paper Rosenstein reported that he had successfully employed puppy-bone grafts in the treatment of an injury of the first phalanx of a child's finger. Mosse, of Montpellier,⁶¹_{Dec.1} has experimentally transplanted osseous grafts on an animal of different species.

“It is sufficient to preserve the periosteum for this reimplantation to be effected with success.” According to Albertin,¹⁰⁸_{Sept.15} bone grafts, whether from animals or man, should be small and covered with periosteum and applied upon a granulating, non-suppurating surface. Success is possible only when the parts are kept absolutely quiet and under strict antisepsis.

JOINTS.

General.—The curative influence of rest in the treatment of chronic joint disease is strongly insisted upon by Ridlon,⁵⁹_{Sept.15} Gibney,¹_{Oct.27} Gerster,⁹⁶_{Apr.} and by Robert Jones.²²_{Feb.3} Ridlon declares that the early “use of efficient fixative apparatus combined with a longer or a shorter period of rest in the horizontal position abso-

lutely insures a cure, without other deformity than shortening, in all joints except the spine; and in the spine it insures against any increase in the curvature, and a diminution and absolute reduction of the curve in very many cases, and, not infrequently, freedom from rigidity." Robert Jones showed at one time upward of twenty patients who had been cured of serious joint lesions by prolonged rest, in five of whom albuminuria had existed for many months. That prolonged immobilization will not always produce ankylosis was proved in one of his hip cases in which the splint was kept on for four years, yet when removed there was free motion of the joint. Gibney states firmly his "belief that whatever ankylosis occurs in a joint which has been subjected to immobilization occurs not by reason of the immobilization, but of the nature and intensity of the inflammation and of the inefficiency of the apparatus employed;" and Ridlon thinks "that the dangers to the general health from confinement to the horizontal position have been exaggerated, and depend upon unfounded assertion and observation of cases treated without, or with but imperfect fixation." Gerster advises, in addition to rest, the employment of prolonged, properly graduated, dry refrigeration of the joint.

Gibney, advocating a treatment of these cases similar to those of tuberculous disease in general, regards change of air or climate as exceedingly important. "The time will come when we shall feel that it is as important to send our bone cases to the mountains or to other health resorts as it is our pulmonary patients."

That chronic disease in children may be prevented, Hubbard⁵⁹_{Nov. 10} urges: 1. A careful inquiry of the surgeon into the hereditary history of each family of which he may have charge, and if a well-marked history of hereditary disease, especially tuberculosis, is found, a warning should be given to the parents of the dangers to which the children are exposed. 2. Instruction in regard to hygiene, diet, etc., with the endeavor to keep the nutrition of the children up to the highest point until they have passed the period at which they are most liable to contract a joint lesion, viz.: the period of puberty. 3. When tuberculosis is present in a family, either as phthisis pulmonalis or a joint lesion with an abscess, all sputa or discharges should be destroyed or disinfected, and healthy children should be brought as little as possible in contact with the sick. In this way the risk of direct contagion may be reduced to

a minimum. 4. Instruction should be given in regard to the importance of any traumatism of a joint or the parts near it, however slight it may be. After such an injury, absolute rest of the joint should be insisted upon until all evidence of inflammation has subsided and the function of the part is perfectly restored. 5. The prohibition of all sports or exercises which bring repeated traumatism upon one joint. Young children should not be allowed to go up and down stairs frequently. 6. After one of the acute exanthematous fevers, a considerable period should elapse before active exercise, such as running, jumping, or long walks, is allowed. B. Holmes²³¹_{Sept.} states that "in all cases of joint disease, especially when painless, the possibility of a neuropathic origin should receive attention, and careful examination of the various nerve functions should be instituted. In all cases of multiple joint tuberculosis, especially when symmetrical, the fear of primary neuropathic origin renders the prognosis less favorable."

Hysterical Affections.—These were made the subject of a lecture by Esmarch while in New York, and one by Charcot.⁷³_{Jan. 23} The latter urged the great importance of moral treatment combined with general, and massage of the joint, and declared that "these arthralgias may be classed among those hysterical affections which are the most persistent and the most difficult to cure."

Foreign Bodies.—Cases of traumatic origin are reported by Boeckel¹⁰⁸_{Apr. 21} and Syme,²⁸⁵_{July 16} part of head of radius; by Riesenfeld,⁹⁷_{Jan. 23} small piece of patella, piece of external condyle of femur; by Marsh,²_{Apr. 14} by Teale,²_{May 26} and by Vincent.²¹¹_{Mar. 26} The occurrence of a joint injury detaching a piece of cartilage or bone or causing later separation by "quiet necrosis," thus originating a foreign body in the joint, is much doubted by Humphry,²_{Sept. 29} who, after an extended consideration of the method of formation of such bodies, concludes that: "1. Although I am not aware of any instance in which a portion of articular cartilage has been detached by a blow, yet in two cases (Simon's and Teale's) this appears to have resulted from a violent wrench. In each case the loose body so formed was removed by operation. 2. In none of the instances that I have read of, in which the formation of a loose body has been attributed to necrosis, does the evidence of such process appear to me to be satisfactory. The resemblance in structure of certain of these bodies to articular bone and cartilage as an argument in favor of

that view, and perhaps the strongest, is, in a great measure, set aside by the discovery that this resemblance exists, also, in loose bodies formed in the ordinary way, namely, by synovial outgrowth, these being found in microscopical characters and general features much to resemble portions of articular bone and cartilage. They may, however, be distinguished by one or more of the following features: (a) The presence in greater or less amount of fibrocartilaginous or fibroid, as well as cartilaginous tissue in the body. (b) The imperfect denudation of the bone upon the rubbed down, or applied, surface of the body, so that remnants of cartilaginous or fibrocartilaginous or fibroid tissue are found there. (c) The varying thickness of the cartilaginous covering, which in some parts may exceed that of normal articular cartilage, and its extension over the rounded edge of the body, to a greater or less extent, upon the circumference of its applied surface. (d) The knotty outline of the osseous nucleus and the imperfection of its bone-formation. (e) The size of the loose body being greater than that of the cavity in the condyles, so that it rises above the level of the surrounding articular cartilage. The presence of any one of these features renders a derivation from the articular surface very improbable, and the combination of two or more of them renders it almost impossible." Marsh²_{Apr. 14} strongly opposes the position taken by Professor Humphry. Riesenfeld⁹⁷_{Jan. 28} regards the pain so often associated with the presence of these bodies as largely due to their tearing the capsule in the movements of the joint and not to their being caught between the bones. Jackson²_{Feb. 18} reports having removed a cartilage from the knee-joint two and one-half by one and three-quarters inches, and half an inch thick.

Detached Semilunar Cartilage.—Treatment by suturing after the method of Annandale was successfully practiced by Allingham²_{Nov. 28} and by E. Owen.²_{Nov. 24}

False Ankylosis.—In cases of contracted knee-joint due to tubercular disease, Dollinger¹¹³_{Jan. 22} favors treatment by gradual extension and the after-application of a felt splint worn for a long time. In eighty-six cases thus treated there was no recurrence of the contraction. The shortening in these cases, it is noticed, does not occur during the stage of acute inflammation, but later. In two cases Gibney corrected the deformity at the knee by gradual mechanical straightening, using a jointed splint.

Weigel,¹_{June 10} recommends the employment of elastic tension, and describes an apparatus for producing extension at the elbow and at the same time allowing rotation of the forearm.

As the result of forcible breaking up of ankylosis at the knee there occurred gangrene necessitating amputation through the thigh. Stavely,⁵⁹_{Oct. 20} Suppuration in the hip-joint was produced by similar treatment of adhesions following osteomyelitis in a case of Miller's.⁹⁸_{Oct. 20} Poncet,⁷³_{No. 20} in a case of true ankylosis of the knee following gunshot injury, treated by osteoclasis, had abscesses form and grave trophic disturbances occur; and he calls attention to the dangers attending the treatment of ankylosed limbs that have previously been the seat of grave disease. When occurring in the fingers, it should, according to Niehans,²¹⁴_{July} be treated by massage and forced passive movements, after from one to two weeks' immobilization of the injured finger. Immobilization, he holds, is ordinarily continued too long. The treatment indicated should be kept up from two to four weeks, any existing thickening of the ligaments being relieved by hot douches.

Riziform (Melon-Seed) Bodies.—Schuchardt,²⁰_{Oct. 2} in a lengthy article upon the formation of these bodies in tendon-sheaths and joints, holds that they “are not composed of ordinary fibrin, and cannot be considered in any case to be produced by coagulation of the fluid contents of the sac or joint. They are rather products of coagulation necrosis of the internal wall of the sheath or sac.” He does not think that the villous and warty growths found within some hygromas are the main cause of the free riziform bodies often associated with this condition; for even where such villous outgrowth is present it may bear no relation to the free bodies, and the rapidity with which these bodies sometimes re-form after the sac has been evacuated tells against their passing through a stage of villous excrescence. Indeed, he has found the wall of a ganglion largely composed of agglutinated and flattened half-formed riziform bodies. The size and form of these bodies are doubtless mainly determined by the movements to which they are subjected, so that when mobility of the parts is slight they form less readily than when it is free and marked. Examined by Jalaguier, they were found to be developed upon the surface of the synovial sheath, later being pushed out, and finally becoming free. Wallich,³_{Nov. 21} though he could not discover bacilli in them, was

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able by inoculation to produce tuberculous disease in two guinea-pigs.

Tabic Arthropathy.—Syms, ¹_{July 7}, in a paper read before the Society of the Alumni of Bellevue Hospital, discusses the pathology, symptoms, and theories of origin, and gives the history of a case under his care. As respects its causation, he inclines to the belief that the disease is “due to traumatism or some change in the condition of the joint to be affected.” J. Wolff, ⁴¹_{Mar. 15}, has in one case done arthrectomy of the knee-joint with a favorable result. Pavlidès ⁴⁵²_{No. 4} contributes an article on the “tabetic foot,” based upon seven cases observed in the service of Damaschino at the Laennec Hospital. He finds that marked outward deviation of the metatarsus does not always occur, being in some cases altogether wanting, in others not very decided, the chief deformity being in the vertical plane. The amount of deformity has no constant relation to the extent of the bone-lesion. The foot is usually flat, but the plantar arch may be not only preserved, but exaggerated. The malleoli are enlarged, movements of the foot are generally not painful, and there is usually some dry crackling. The foot as a whole may be ankylosed. When the deformity is very much developed the patient may be unable to walk on the foot, and compelled to use crutches. Sometimes the disease progresses very rapidly, reaching its height in a few weeks; in other cases there are successive exacerbations and periods of rest. Repair of the lesions is impossible, and any apparent diminution of deformity is due to disappearance of the effusion in the joints and periarticular tissues. The sensibility to cold and touch is generally greatly diminished, the dorsal region becoming completely insensible. Similar disturbances of sensibility may exist in the other healthy foot. The ankle-joint is almost constantly affected. The bones of the tarsus and metatarsus are so in different degrees. Sometimes (such a case is reported) it is not the foot but a toe which is the seat of the arthropathy, when the first phalanx will be found to be extended, the second strongly flexed, the third extended, forming an acute angle with the second. One of the patients having died of phlegmasia alba dolens, Pavlidès found that there was nothing peculiar about the lower end of the tibia; that of the fibula was enlarged. The articular cartilage of the ankle-joint had entirely disappeared. The bones presented numerous elevations and depressions, though the surface was

smooth and polished. That surface of the os calcis upon which the external malleolus rested was red, rugous, and destitute of cartilage, as was the outer third of the calcaneo-astragaloid articulation. Upon the astragalus the lesions were less advanced than upon the os calcis. Of the other bones of the foot only the first metatarsal was affected, its anterior extremity being hypertrophied and its articular surface largely deprived of cartilage and irregularly mammellated. (See colored plates.)

Long-continued Painful Arthritis.—Poncet³_{Apr. 4} and Audry⁹¹_{Oct. 10} call attention to a form of joint inflammation characterized by long-continued pain, which in persistency and intensity is not accounted for by the existing disease. Though not confined to them, it is most often met with in women, and the knee seems to be especially predisposed to it. The only other lesion with which it is likely to be confounded is one of very chronic tubercular nature. In the three cases treated by Poncet and observed by Audry, no medical treatment relieved the pain; and it is believed that nothing short of amputation will affect a cure, though perhaps good results may follow nerve section or, better, stretching. One of the three patients died after disarticulation at the hip-joint, necessitated by the atrocious pain in the whole lower extremity.

Spondylarthritis Synovialis.—Caspari, of Cracow,⁷⁵_{July 1} writes at some length of this disease, which had been noticed by Hueter. He has found it quite common in Russia, and believes it to be due to "catching cold." Most of his patients were adults. It is an inflammation of the joint of the articular process, most common in the cervical, next in the lumbar part of the column, while it may affect all of the vertebræ. In the dorsal region it is, so far as he has observed, always unilateral; in other regions often bilateral. When present, there is pain on pressure a little to the side of the median line, muscular rigidity, and impaired mobility; and when located in the cervical region there may be much pain on swallowing. Ordinarily there is no fever, though at times a temperature as high as 102 $\frac{1}{2}$ ° F. (39° C.) has been observed. Commonly the disease lasts for from three to eight days. Weeks or even months later there are often noticed symptoms of descending neuritis in the arm and leg, by far the most important part of the disease. The diagnosis is usually easy, but hysteria may so strongly stimulate it that a true diagnosis can only be made by time. When affecting

the entire side the symptoms may be quite like those of brain disease. The treatment advised is the injection of a 2 or 3 per cent. solution of carbolic acid, thrown in directly over the process or along the course of the affected nerves. So far as has been observed such treatment does no harm and is truly curative.

Intermittent Dropsy.—A. H. Friedenber⁵⁹ reports ^{June 16} two cases of periodical dropsy of the joints and refers to twenty-three other cases already on record. He regards the affection as due to vasomotor neurosis, and advises the employment of electricity.

Rheumatoid Arthritis.—Spender ^{Feb. 18} ^{Apr. 14} ⁶ ² calls our attention to “some hitherto undescribed symptoms in the early history;” to wit, a rapid pulse (eighty to one hundred and forty-five) without fever; the skin pigmented in patches on various parts of the body; local perspirations, especially on hands; specific neuralgia, limited or quite diffused; and, less often, gastric crises, asthma, or migraine. In a man of seventy, Alexander ^{July} ¹⁸⁷ found an ankylosed condition of all the cervical vertebræ. Osler ^{Nov. 24} ⁵⁹ advises the use of Fowler’s solution, beginning with five drops and increasing the dose up to the limit of tolerance.

Chronic Pyæmia.—Clutton reports ^{Feb. 4} ⁶ a case in a child, eight and a half years old, in which the right shoulder, the right hip, and both elbow-joints were freely opened up at one operation. Recovery followed, and in all the joints except the right elbow mobility was secured.

Syphilitic Disease.—Hutchinson ^{Oct. 20} ² presented to the Pathological Society a knee-joint in which there were no nodes on the bones, and the synovial membranes and ligaments other than the ligamentum mucosum appeared healthy, “the chief seat of the disease being in the cartilaginous surfaces of the joint.” Chénade, ^{July 25} ²⁸⁷ reporting two cases of secondary syphilitic arthritis, says that the disease may present itself in three forms: (1) arthralgia giving rise to no apparent lesion; (2) subacute arthritis; (3) hydrarthrosis. The duration of the disease is short, not exceeding two weeks, and there is no involvement of the heart or the viscera.

Extra-articular Abscess.—In a case of hip-joint disease reported by Poore ^{Mar. 17} ¹, an intrapelvic abscess formed, which opened into the rectum and the bladder. After removal of the head of the femur and opening up of the abscess, perineal cystotomy was made. Recovery, though long delayed.

Associated Tuberculosis and Rheumatism.—Jonesco³_{Aug. 10} presented to the Tuberculosis Congress a case of rheumatism and joint tuberculosis in the same patient, the first-mentioned disease having established “a place of least resistance,” in which the bacilli were deposited.

Associated Knee-Joint Affections and Other Diseases.—Moore presented to the London Pathological Society²_{Apr. 9} a knee-joint from a patient who had had gout, in which there was a deposit of urate of soda upon a part of the synovial fringe, and knee-joints from two cases of cirrhosis of the liver showing erosion, eburnation, and lipping. Liégeois¹⁸⁴_{Oct. 1} states that he has twice seen acute inflammation of the knee precede for some days the ordinary symptoms of tubercular meningitis.

Fungous Tenosynovitis.—Le Bec,¹⁰⁰_{Jan. 24} in a case of long-standing fungous disease of the palmar bursa and the sheaths of the flexor tendons in a man aged seventy, opened the bursa and the sheaths, scraped them, removed affected portions of tendons and bones, and secured a useful hand. In one of Le Fort's cases recurrence took place after thorough scraping and the use of the galvanic cautery.

Bursal Tumors.—Chavasse⁹¹_{Sept. 10} reports a case of cystic myoma of the bursa under the ligamentum patellæ, which in its growth covered over the anterior part of the internal condyle of the tibia. According to Chavasse, only two other cases of like character are to be found on record, observed by Gosselin and Ranke. At a meeting of the Montreal Medico-Chirurgical Society, Bell,⁹_{Jan. 1} presented a specimen of exostosis bursata “removed from the inner side of the lower end of the femur of a boy aged twenty.” The bony growth was about the size of an orange, and appeared to spring from the condyle below the epiphyseal line. It had a bony pedicle three-quarters of an inch long and half an inch in diameter, and grew upward and inward. Its surface was covered with cartilage in small isolated nodules, which were closely placed and formed a continuous layer over its surface. The whole was inclosed in a perfectly formed synovial membrane, which was continuous with the periosteum of the pedicle. The sac contained half an ounce of amber-colored synovial fluid in which loosely floated fifty-four cartilaginous bodies, looking exactly like the floating cartilages found in the knee-joint. These varied in size

from a bean to a small pea. Dr. Bell stated that the only record of any similar cases he had been able to find was in a paper read by Fehleisen at the Fourteenth Congress of German Surgeons, in 1885. Fehleisen reports a case which had recently occurred in Professor Bergmann's clinic, and refers to another which had been seen in Billroth's clinic in 1863. These he believed to be the only ones on record at that time (April, 1885). Dr. Bell said these two cases corresponded exactly with the one now related by himself. In Bergmann's case the synovial membrane contained about five hundred loose cartilaginous bodies, and in Billroth's case thirty-five were found.

Treatment of Chronic Synovitis of the Knee.—Waugh⁶²_{Sept. 16} has employed with success salol internally and ichtyol and lanolin locally; Allexich²_{Sept. 16} keeps the knee immersed in hot water for a half hour at a time, afterward applying cotton and a bandage; and Selenkow²¹_{Nov. 5} has had good results from ignipuncture (best when the disease is only synovial), the pain ceasing and the patient soon being able to walk.

Puncture of Joints.—Hager¹⁶⁹_{Mar.} has in fifteen cases of fracture of the patella drawn off the fluid to permit of adaptation of the fragments, and even in metastatic affections advises puncturing before resorting to free incisions. Bosset, in a thesis, advises the removal of extravasated blood, preferably with the aspirator, as rapid improvement of the condition of the joint follows.

Treatment by Irrigation.—Terrillon¹⁰⁰_{Feb. 21} employed with success a 3 per cent. carbolic irrigation in a case of hydrarthrosis of the knee which had lasted three years, and Stoudentsky³⁵_{June 14} recommends the same solution. V. Jackson³²_{Feb.} uses a 5 per cent. solution, distilled water being first injected until it flows away perfectly clear and apparently quite free from admixture with synovial fluid. In a case reported a previous irrigation without such preliminary washing failed because of an inability to free the joint of some masses of coagulated albumen. Hager¹⁶⁹_{Mar.} employed a 3 to 5 per cent. carbolic solution in one hundred cases of dropsy of the knee, and all were cured except one, in which death resulted from phthisis. In acute cases recovery took place within two weeks. Treves²_{July 7} treated a case of acute suppuration of the knee-joint by a thirty days' continuous irrigation with a weak solution of boric acid, a good and movable joint being secured. A brief but very

good paper has been published by Schwartz³⁵ on the treatment of suppurating arthritis by arthrotomy, in which are given indications as to place and manner of opening the several larger joints.

Atrophy Following Inflammation.—Bock,²⁷⁶ regards electricity (both the continued and interrupted currents) as the chief remedy in the treatment of the extensor atrophy so generally associated with chronic arthritis of the knee, and due, he holds, to an ascending neuritis. The treatment should be commenced as early as possible, and continued for some time after the muscles have regained their power. In this way retraction of the leg and ankylosis in flexion may be prevented. Kippel,⁷ upon microscopic examinations of the spinal cord and nerves from a case of muscular atrophy following arthritis of the knee, found granulo-pigmentary degeneration in the lumbar and middle cervical regions.

PLASTIC SURGERY.

Sir William MacCormac² made this the subject of a lecture, notice being taken of the methods of operating, the treatment of the flap, of several classes of cases in which plastic operations were indicated, and finally the operative treatment for repair of nerves. Keetley,⁹⁸ recognizing the necessity in all plastic operations of preventing septic inoculation, holds that the ideal operation is an aseptic rather than an antiseptic one, and favors the use of recently boiled water rather than any of the irritant stronger germicide solutions. Ligatures he thinks scarcely ever should be employed; and to guard against tedious and troublesome hæmorrhage he would use scissors rather than the knife, except in the division of the skin.

Grafting.—Delagenière¹⁰⁰ has considered at considerable length the subject of “cutaneous and epidermic grafts in the treatment of ulcerated wounds,” concluding that when the surface to be covered is extensive, and the condition of the patient is not such as to contra-indicate the administration of an anæsthetic, the method of Thiersch should be employed, while upon smaller surfaces, and when the anæsthetic cannot safely be given, the Reverdin method is to be preferred. When the latter method is adopted, Yemans²²⁷ has found it advantageous to sink the grafts out of sight in the granulations, afterward dusting iodoform over

the surface and leaving the parts without dressing—*i.e.*, open. Papers upon and reports of cases treated by the Thierson method have been published by Garré,²¹⁴ Plessing,²²⁶ Bell⁴⁷⁶ with report of eight cases, Heydenreich,³ Thiersch,⁵ Holmes,⁵³ Schaeffer,⁴⁶² and others. In Schaeffer's case the entire scalp had been torn off by machinery. Heydenreich calls attention to the fact that in syphilitic subjects failure is likely to occur, and there is therefore a necessity for the preliminary employment of antisyphilitic treatment, and Thiersch to the non-adherence of transplanted skin to compact bone, and to the unsuccessful results which follow the application of isolated pieces of skin upon raw surfaces communicating with cavities lined with mucous membrane. The likelihood of the grafts to disappear after a time is noticed by Berger, Lucas-Championnière, and others. In a case of burn reported by Hartens,⁴ successful grafting was effected with pieces of skin, about three-eighths by three-sixteenths inch, taken from the leg of a corpse twenty minutes after death; and Stephen Smith⁵⁹ states that he once took seventy-five grafts from a leg amputated over two hours before, of which seventy-three lived and grew. In anaplastic operations by the Italian method, Berger,³ regards it as very necessary that attention be given to the position that must be taken after the operation, and that the patient be trained to keep it, and advises the use of plaster-of-Paris dressings.

Mucous Grafts.—Wölfler,⁴ ⁶¹_{No. 17; Sept. 16} at the last Congress of German Surgeons, read a paper on this subject. He restores the continuity of the mucous membranes after excision of neoplasms or cicatrices by transplanting strips of mucous membrane to the uncovered places. The grafts were at first taken from the uterus or rectum of persons suffering from prolapse, or from the cervix of amputated uteri. Later he used the mucous membrane of animals (the stomach of the frog, œsophagus of rabbits, etc.), though his experiments in this direction are not completed. The mucous membrane was excised by the method given by Thiersch for epidermal grafts, or simply separated from the muscular layer of the viscera. He found that mucous membrane adhered as firmly as the epidermis. Three cases of urethral stricture treated by this method are reported. The mucous grafts were taken from the prolapsed uteri of two females. The urethral cicatrix was completely excised, and the granulating surface covered with mucous membrane after

Thiersch's method. No suture was required, but the surface was protected by a strip of iodoform smeared on its inner side with vaseline. The dressing was removed in from three to four days, when a grayish, sticky mass was found beneath. In three more days the granulating surface appeared as if covered with a film of mucous, and at the lapse of an equal period, the granulation tissue was seen to be replaced by a smooth glistening layer of perfectly formed mucous membrane. Equally successful results were obtained in blepharoplasty and rhinoplasty, the mucous membrane being taken from the prolapsed rectum of a child and from an amputated cervix uteri. In an operation upon the cheek the author successfully employed mucous membrane from the œsophagus and stomach of a rabbit.

Animal Grafts.—Rabbit-skin has been five times used by Cadogan-Masterman,²_{Jan. 28},²⁶_{Apr. 3} four times with success. In this operation, to which he has given the name of *dermepenthesis*, he much prefers the wild to the tame rabbit because of the great amount of fat connected with the skin of the latter, and cuts pieces of about the size of a silver quarter. The fur comes away within a week. Mynter²⁵⁰_{Sept.} reports having successfully transplanted rabbit- and pig-skin. Rédard²⁸⁹_{Jan.} has published a very interesting paper on the use of chicken-skin (taken preferably from under the wing) and reports three cases in which he employed it. He believes that absorption of such grafts will be found to be of exceptional occurrence. Orceel,²¹¹_{Apr. 8} on the contrary, thinks that they are eliminated, but serve the purpose of stimulating the granulations of the part and favoring cicatrization.

Sponge grafts are reported by Huntington¹⁴⁷_{Aug.} and Huybertz¹⁷⁴_{Aug.} as having been successfully employed.

Buried Sutures.—Reverdin,¹⁹⁷_{Aug. 20} in a paper read before the Congress of French Surgeons, strongly favors the employment of buried sutures in plastic operations, and reports at length four cases illustrative of his practice.

Rhinoplasty.—To supply the place of the nasal bones, V. Hacker,³³⁶_{July 28} raises, with the lower part of the skin-flap from the forehead, the periosteum and a thin layer of bone, which, when placed in position, are fastened by catgut sutures. Two cases are reported in which good results were secured. To replace a lost end of the nose, Professor Helferich, of Griefswald, corresponding

editor, takes two flaps from the cheeks, that from the right side being laid over upon that from the left.

Shaw²⁰⁶_{Mar.} reports in detail twenty-four cases, and states that he has operated on about thirty more; he expresses a preference for the forehead-flap operation.

Face.—Heydenreich,³_{Apr. 25} in cases of extensive removal of parts of the face (especially for malignant disease when there is danger of local recurrence), advises that immediate plastic operation should not be made, but that time should be given in which contraction of the parts may occur. By doing so a much smaller gap will have to be closed by a secondary anaplasty. In the surgical treatment of perforations of the cheek V. Hacker⁸⁴_{Feb. 4} holds that it is of primary importance to make an inside flap as well as a skin one, in order to guard against shrinkage. Two skin-flaps are mapped out, the skin cut, and the flaps loosened so that they hang only by broad pedicles of connective tissue. One is then turned over so that its epidermal surface looks toward the cavity of the mouth, and the other is laid upon it so as to fill up the gap in the skin. The only after trouble is from the hairs growing on the oral surface; but these after a time fall out—in less than a year, according to Gussenbauer.

Hardie,⁹⁰_{June} in a case of rodent ulcer in a young man, successfully applied a flap taken from the arm after the Italian method; and in the same article is reported a case of injury of the hand treated by a flap taken from the chest-wall.

Cleft Palate.—Wolff, as reported by Helferich, corresponding editor, advises that the operation should be made early, and states that he has thus treated twenty-nine cases, six of the children being less than a year old, sixteen under five years old. The result in each of these sixteen was satisfactory, and in none of them did the healing require more than from twelve to sixteen days. By operating thus early he thinks that in fewer cases will the patient have to wear an obturator. He recommends operating slowly and with the head dependent.

Thumb.—The subject of the restoration of the thumb, and especially the Guermonprez operation (noticed in the last ANNUAL), is treated at length by Hanotte¹¹⁹⁵ and by Lauenstein.⁶⁹_{July 26} The latter, in a case in which the thumb had been removed, operated by the following method: After severing the metacarpal bones of

the index and little fingers with a chain-saw introduced through a very short incision along the dorsal surface, he bent these fingers at the first interphalangeal joint, and, forcibly rotating them toward the palm and toward each other, fixed them in this position by means of a suitable splint. Recovery followed without complications, and, at the date of the report, the index and little fingers of the still somewhat swollen hand were in such a position that, when bent, their tips met, and the patient could hold with considerable firmness small objects between them. The rotation of the little finger was more successful than that of the index, but this was due to the hardening of the tissues resulting from the sailor's work. A hand in which the metacarpus of the thumb was lost would give better results, as the index finger could be better rotated. The operation is advised in cases "in which the patient has been doing, or wishes to do, delicate work with the hand, such as tailoring, watch-making, goldsmiths' work, etc. The hand after operation is especially well adapted for holding the pen."

DISEASES AND INJURIES OF ARTERIES AND VEINS.

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SEVERAL very important articles on the general subject of aneurisms and on cognate topics have recently appeared. Among these, as the most elaborate, may be mentioned a series of five communications by R Thoma, of Dorpat, ²⁰_{Jan. to Sept.} entitled "Researches upon Aneurisms." Scheele, of Dantzic, ¹¹⁶_{Jan.} has discussed "The Present Status of the Treatment of Aneurisms." Delbet ⁹¹_{Nov. 10} has made an exhaustive study of "The Treatment of External Aneurisms," which has not up to this writing been concluded, and of which a complete review will be Thoma's researches, the latter leading him to propose the following classification of aneurisms:—

I. Congenital aneurisms, which are formed during foetal life or at the time of birth. (These are not to be confounded with those called congenital by Eppinger.) Two cases of aneurism of the duct of Botal (ductus arteriosus?) which belong here are dilatations of the unclosed duct.

II. Arterio-sclerotic aneurisms.

(a) By dilatation.

1. Diffuse.
2. Fusiform (simple).
3. Fusiform (multiple).
4. Sacciform.
5. Skenoid or tent-like.

(b) By rupture.

1. Dissecting.
2. Sacciform.
3. Varicose (communicating with a consecutively large vein).

III. Traumatic aneurisms.

1. Diffuse.

2. Circumscribed.
3. Varicose.
4. Aneurismal varix.

IV. Embolic aneurisms.

1. Simple, arising from merely obstructive emboli (Ponfick). Two cases of this class presented the characters of sacciform rupture-aneurisms with neoplastic fibrous walls. In the calibre of the vessels were noted pointed, spike-like fragments of chalk, evidently derived from the valves of the heart.
2. Infectious, arising from infectious emboli (Eppinger).

V. Aneurisms by erosion, as, for example, of the pulmonary artery (P. Mejer, Eppinger).

VI. Cirroid aneurisms (neuropathic?).

The aneurisms of the cerebral arteries can be readily placed under the second and fourth of these classes, while the multiple aneurisms of small and medium-sized vessels (Rokitansky, Kussmaul-Meier, and P. Mejer, congenital aneurisms of Eppinger) must be provisionally ranked by themselves until their etiology can be more clearly proved.

Scheele,¹¹⁶ from a comprehensive review of the subject, is led to regard the treatment of aortic aneurism at present as determined by the time at which the diagnosis is made, the seat of the lesion, and the degree of disturbance of neighboring organs. When the nature of the affection is detected early, the treatment consists in absolute rest in a favorable position, the application of ice, and the regulation of the diet according to Tufnell's idea, viz.: the limitation of the ingestion of liquids. Later, the subcutaneous injection of ergotin is employed, and also the internal use of iodides, with opium, until the tolerance of them is attained. When the disease is of longer standing, of which the size of the swelling serves as an approximate test, and if it is more superficial, in addition to the above measures galvano-puncture or distal ligature will be demanded. The latter is especially suitable for the innominate. In special cases the therapeutics must be modified to meet complications or consecutive disturbances. Narcotics are indispensable to control the agonizing neuralgia of these cases.

We note with pleasure that the excellent essay of J. Collins Warren, of Boston, "On the Repair of Arteries after Ligation," has been translated into French, and republished in one of the leading medical periodicals of Paris.

Souchon, of New Orleans,¹²_{Mar.} has called attention to what he regards as an important anatomical arrangement of the arterial system: That each of the main arteries gives off a collateral or *surgical* branch, which acts as an anastomotic medium in case of interruption of the blood-current through the former. Professor Souchon reviews the entire arterial system, developing his idea in regard to each portion of it.

Lohse¹³_{May 15} has made an elaborate study of dissecting aneurisms. He thinks they may be due in the old to atheromatous change, in the young to congenital malformation of the central organs of the circulation—sometimes also to traumatism. Hypertrophy of the heart, especially in its left half, is often present. Traces of peri- or endo- carditis are often to be noted. He thinks that the rent in the inner coat sometimes precedes, sometimes follows, the distention. A number of rents may exist in the same subject. The further from the heart the lesion is, the better the chance of recovery.

Germain Sée,³_{Aug. 15} referring to the frequency with which persons suffering from aortic aneurisms become tuberculous, suggests that the diminished activity of aeration may cause the lung to afford a favorable nidus for bacilli, and that the arterial lesions may be due to the presence of such organisms, which may be washed into the pulmonary tissue and develop there.

He advocates the employment of potassium-iodide and anti-pyrine in the treatment of aneurism of the aorta.

Verneuil²⁹⁰_{July 21} sums up a careful discussion of Moore's method of treating aneurisms, which he calls "filipuncture," as follows: It has proved hurtful or useless in somewhat more than 96 per cent. of the cases. It is not simple or harmless. It is not effective, although sometimes for a brief period apparently so. It is uncertain, and its technique is not uniform as practiced. It is less easy of execution than it has been represented. Its results, regarded either as a radical or as a palliative procedure, are inferior to those obtained by other means, whether medical or surgical. Possibly it may be kept in reserve as a resource in cases of aneurism

of the abdominal aorta. It is not known to have prolonged life in any instance, but has sometimes shortened it. Upon the whole evidence it should not be viewed with favor, nor its adoption countenanced.

Taylor, of Tollesboro, Ky., ²²⁴_{Apr. 14} records three cases of aneurism, two of the primitive carotid and one of the aorta, in which decided benefit was obtained by the administration of potassium iodide.

Holmes ⁶_{Mar. 3} reported to the Clinical Society of London the issue of a case in which he tied the left carotid artery twelve years ago for what was supposed to be aortic aneurism. Death having occurred from phthisis, it was found that the aorta and its branches were healthy. The symptoms had been due to stenosis of the valves of the pulmonary artery, with dilatation of its left branch.

Great hæmostatic power is claimed ²²⁹_{Aug.} for the chewed or bruised leaves of two plants—one, the *Tradescantia erecta*, a Mexican weed; the other, *Plantago lanceolata*, very common in England, and known in America as the plantain.

St. Marc ⁹²_{Oct. 13} speaks very highly of the internal use of distilled tar-water as a general hæmostatic.

In cases of arterial bleeding, Treves ⁶_{Jan. 21} advocates temporary constriction of the vessel of supply. Thus, in a case of wound of the thyroid, he cast a loop around the common carotid artery and maintained traction upon it for half an hour, after which the hæmorrhage did not recur.

From the researches of von Horoch ³³⁶_{Sept. 15} upon the suture of arteries, he concludes that this procedure leads to the complete closure of the vessel as surely as the ligature, but less quickly, and that only the sutured part is cut off from the general circulation. Silk was found better than catgut for the purpose. The suture would seem to be indicated in those cases of wounds of large arteries in which the ligature has been found by experience to interfere injuriously with the circulation.

As to the suture of wounded veins, in three experiments the vessel remained patulous, its lumen being more or less free. It is, therefore, preferable to the lateral ligature, since, according to Blasius, the latter causes the formation of an obstructive thrombus.

Bryant declares his persistent belief in torsion for the arrest of arterial hæmorrhage, and Murdoch, of Pittsburgh ¹⁶¹_{Sept.} agrees with him.

Böttcher¹¹⁷⁵ confirms the experiments of Pick and Güterbock, showing that the blood included between two ligatures applied to a living artery remains uncoagulated for several weeks at least.

Some clinical reports bearing on the general subject of arterial disease may be referred to here. Dunlop²¹³_{Aug.} records an interesting case of multiple aneurisms, proving fatal, in a woman, aged sixty-six, free from syphilis or alcoholism. Barbier⁷_{Dec. 37} gives the history of a case in which numerous emboli occurred with fatal effect, in a woman, aged forty-two, from the detachment of portions of a large clot in the aorta. Tiling, of St. Petersburg, ²¹_{Nov. 5} reports a case of fatal secondary hæmorrhage after amputation of the thigh for railroad injury in a man affected with atheroma.

ARTERIAL SYSTEM.

Head and Neck.—Williams, of St. Paul, Minn., ⁶¹_{Jan.}, records a case of rupture of the internal carotid artery within the cavernous sinus, causing pulsating exophthalmos. The common carotid was tied; bleeding occurred on the tenth day, and the artery was tied afresh, but the man became hemiplegic and aphasic, and died ten days afterward. The brain was found normal, except the left anterior lobe, which was largely softened.

Prewitt⁸²_{May 26} reports an instance of cirroid aneurism from traumatic cause, in a lady aged thirty-six. The mass was successfully excised without transfixion. Another case in a woman, aged twenty-nine, transfixed and excised with good result, is given by Wright. ⁶_{Apr. 7}

Stimson, ¹_{Feb. 25, May 19} in a case of traumatic arterio-venous aneurism, tied the common carotid; four years later, the symptoms having reappeared, ligation of the external and internal carotid was resorted to and a cure obtained.

Le Fort³_{Nov. 14} has reported the case of a girl who, by the kick of a horse, had an arterio-venous aneurism of the carotid in the cavernous sinus. First the right and then the left primitive carotid was tied; the patient was relieved, but still had some protrusion of the right eyeball, a vein enlarged at the angle of the eye, and a thrill perceptible to herself.

Eisenlohr⁶⁹_{Nov. 1} showed a specimen of aneurism of the artery of the left Sylvian fossa, the size of a cherry, which had caused marked symptoms during life.

D'Antona, of Naples, ⁷⁰⁸_{Apr. 11} relates an instance of an aneurismal varix between the external carotid artery and the jugular vein. Ligation of the carotid (external ?) and of a collateral branch in front of it, was performed, and two ligatures were placed on the carotid higher up. Some localized thrill yet remaining, excision of the tumor was contemplated in case of the occurrence of further symptoms.

Jawdyski, of Warsaw, ¹³_{Aug. 15} records a case of tumor of the variety called by Volkmann "bronchiogenous carcinoma;" the growth was situated behind and below the right angle of the lower jaw, in a man aged seventy. In order to its removal, the internal jugular vein had to be tied and divided, and about two inches of the common carotid artery was excised. Six days after the operation, pulsation was evident in the cardiac portion of the artery, but two weeks later it had ceased.

The following singular history is related by Matlakowski ³³⁶_{Nov. 24}: A woman, aged forty-two, had on the right side of the neck a swelling, which was twice opened; the second time it bled, and an aneurism developed itself. Forceps were applied to the common carotid; the external carotid, which was found to be torn off at its origin, was tied, as was also the internal carotid and two smaller vessels, and there was no more bleeding. At the bifurcation there existed the remains of a congenital serous cyst.

Innominate Artery.—Boyd, of Alabama, ¹⁸⁶_{May} reports the case of a boy, seven and one-half years of age, who as a sequel of whooping-cough had what was diagnosed as aneurism of the innominate and right subclavian arteries. The symptoms as detailed would seem to support this view, and the child is probably the youngest subject in whom such a disease has ever been observed.

A singular case is reported from the Philadelphia Hospital ⁶²_{Oct.}: A man, aged forty-nine, had an innominate aneurism, from which a diverticulum three inches long and one and one-half inches wide extended over the clavicle in the direction of the common carotid.

McBurney ¹_{May 5} exhibited to the New York Surgical Society a patient whose right carotid and subclavian arteries had been ligated for innominate aneurism two years previously.

Hartley, of Leeds, ²_{Dec. 8} exhibited to the Leeds and West Riding Medico-Chirurgical Society a case of innominate aneurism, for

which the common carotid and subclavian arteries had been tied three years previously. The tumor had become firmer, and had almost disappeared, but after two years and a half had begun to enlarge again without obvious cause. Extension had taken place upward into the neck, but not, so far as could be determined, toward the thorax.

Dunlop²_{Aug. 11} is reported to have performed this operation twice within a few months; the first case was entirely successful, and the second promised to be so. Relief was given by the same procedure in the case of a woman, aged forty-three, operated on by Percival²_{June 3}, and in a man, aged thirty-three, with a history of syphilis, under the care of Heath.⁶_{Apr. 14}

I have reported¹¹⁷² a case of traumatic aneurism of the innominate from a blow with an iron lever. The right clavicle and manubrium sterni, with one or two ribs, were driven in. Eighty-three days afterward, the symptoms being marked, the carotid and subclavian were tied; some relief was given, but an aortic enlargement increased, and caused death by pressure on the trachea.

Finally, a case reported by Givré²¹¹_{Sept. 23} may be mentioned: A man, aged fifty-four, had had weakness and dyspnœa for four months, but no distinctive symptoms. On his death from suffocation, the innominate artery was found dilated and adherent to the trachea.

Aorta.—A very extraordinary case of aortic aneurism is reported by Clay,²⁶⁷_{Dec. '87} in a man aged forty-four. The dilatation, which involved the third part of the arch, had eroded the ribs and vertebræ, and formed a large swelling on the back. Death was produced by rupture, by pressure of the eroded end of the sixth rib.

Pertik,¹¹³_{May 20} in a sacciform aneurism at the posterior wall of the aorta, in a man aged thirty-six, noted that, while the bodies of the vertebræ were eroded, the intervertebral substance had resisted the pressure.

A very interesting case of dissecting aneurism of the aorta has been reported by Bostroem,⁵⁴_{Aug. 1} the lesion being in an advanced stage of repair by newly-formed tissue.

Walter Smith,⁶_{Nov. 24} in reporting a case of aortic aneurism in a man aged fifty-four, who thirty-four years previously had had a venereal sore and suppurating bubo, and twenty-six years later a popliteal aneurism cured by pressure, raises the question whether

the cause of the disease in the vessels was a local change or a constitutional condition.

Goodell¹⁹_{Mar. 31} refers to the abdominal pulsation met with in some women, and mentions as differential signs between these cases and those of aneurism that in the latter pain, thrill, and an increasing tumor are present, but cannot be perceived in the former.

Upper Extremity.—Hawkins,²_{Jan.} reports a case of axillary aneurism in a man, aged sixty-four, in whom, after an unsuccessful trial of electrolysis, a cure was effected by ligation of the subclavian.

Five cases of a peculiar disease, allied to, if not identical with, the so-called obliterative arteritis, have been recorded, two by Hadden,⁶_{Feb. 11} one by Pearce Gould, one by Walsham,⁶_{Mar. 31} and one by Walter Pye.⁶_{Mar. 31} The right upper extremity was the part affected in each; in Pye's case, a man aged fifty-eight, the disease seemed to have resulted from crutch-palsy. No mention is made of the ultimate issue in either instance. Walsham suggests that the cause may be a nerve-lesion.

Liceaga³⁵_{Oct. 11} relates a remarkable case of swelling of the left upper extremity and side of chest in a man aged thirty-five. All the blood-vessels were greatly swollen, some of the arteries being cirroid; communication between the two sets of vessels existed at several points, so that there was really a multiple aneurismal varix; murmurs were heard in the veins as well as in the arteries. Ulceration of the pulp of the index finger was an early symptom. No history of traumatism could be elicited.

Two cases of laceration of the axillary artery during the reduction of dislocations of the shoulder come under our notice; in one, reported by Holmes,⁶_{Mar. 3} the patient, a man, aged fifty-four, refused operation, and after death the opening into the vessel was found to be very small. In the other instance, recorded by Bartlet,⁶_{Jan. 7} the subclavian was tied with success.

A very interesting case is recorded by Matas, of New Orleans.⁹_{Oct. 3} A man, aged twenty-six, was the subject of traumatic aneurism of the left brachial artery. Direct and indirect pressure having failed, ligation above and below was practiced; the tumor was laid open and part of the sac excised; but success was not attained until the orifices of two vessels of supply, on the inner wall of the sac, were closed by means of sutures.

Yeo,⁶_{Feb. 4} records the case of a woman who had mitral stenosis

and embolism of the right axillary artery, inducing gangrene of the forearm; amputation was performed, but death ensued from embolic pleuropneumonia.

Anderson⁶_{July 28} reports a case of varicose aneurism, the result of a knife-wound at the bend of the elbow, of a man, aged thirty-nine. The Esmarch bandage and digital compression were used without avail; ligation of the median, median-cephalic, and median-basilic veins, and of the brachial, radial, and ulnar arteries, was then resorted to with success.

Le Bec¹⁵²_{Aug. 30} reports a case in which an abscess of the forearm, proceeding from a whitlow, was treated by drainage. Hæmorrhage occurring, it became necessary to tie the radial artery, which was found to have ulcerated through at a point where the drainage tube lay in contact with it.

The matter of arrest of hæmorrhage in wounds of the palm has been discussed by several writers. Levis¹⁹_{July 14} advises extreme elevation of the hand, and if this fails, direct compression by means of a rubber ball or a wad of cotton. Manchester¹⁹_{June 23} reports a success by direct pressure with a mass of cotton soaked in solution of alum. Beard,¹⁹_{Aug. 25} the same with subsulphate of iron. Bosquet³_{May 6} in one case had to ligate the radial and ulnar arteries; Championnière thought he might have succeeded by direct pressure, properly applied. Reece¹⁹_{June 23} advocates pressure on the arteries above the wrist by means of a bag of shot. Rudall²⁸⁵_{June 15} recommends ligation of the brachial. This would seem to be a measure only to be adopted after the failure of less heroic means.

Wherry, of Cambridge,²_{Feb. 18} reports a case in which a woman was severely wounded in the palm by the bursting of a glass bottle; a large traumatic aneurism formed, and gangrene ensued, requiring amputation. On dissection of the hand, it was found that no deep palmar arch existed. (The fact that a number of pieces of glass were still in the original wound would seem to indicate a want of thoroughness in the first dealing with this injury.)

Lower Extremity.—Rochard³_{Jan. 4} reports a case of pulsating tumor of the buttock, in which ligature of the internal iliac was performed by Poncet. Relief was given, but the man returned to his work too soon, and a few weeks later fatal hæmorrhage ensued.

A case is recorded by Murray,¹_{July 7} in which an aneurism of the internal pudic artery was developed after a fall on the buttock, in a man, aged sixty-four, syphilitic and intemperate. A ligature was applied on both sides of the tumor, which was just over the spine of the ischium, and the clots were turned out. Recovery ensued.

Tillaux,³_{July 28} reports a remarkable case of cirroid aneurism of the right groin, in a man, aged thirty-four. The external iliac artery was tied and the tumor dissected out; all went well until the tenth day, when tetanus appeared, and proved fatal in six days.

Picqué,⁹¹_{Apr. 10} reports a case in which he tied the external iliac for aneurism at the groin, and three weeks later an abscess formed at the spot; it did not, however, communicate with the vessel, and healed rapidly after incision.

Bryant,²²_{Jan. 18} in the case of a man aged forty-five, ligated the external iliac artery for aneurism in Scarpa's triangle. Sloughing over the outer side of the leg, with necrosis of the fibula, ensued, but the patient made a good recovery after sequestrotomy.

Granjon,²²⁸_{July 18} reports a case of embolic obliteration of the femoral artery in Scarpa's space, occurring in the course of a pneumonia complicated with endocarditis, and inducing fatal gangrene of the limb.

Potherat,⁵⁵_{Aug. 18} relates a remarkable case treated by Professor Damaschino at the Hôpital Laennec. It was that of a man wounded at Sedan, in 1870. On stripping him, a peculiar aspect of the thoracic and abdominal parietes was noted; there was very marked varicosity of the veins of the right half of the body, as well as of the penis and left half of the scrotum and of the right saphena vein; the right lower limb was enlarged, as was the left also, but in less degree. A scar was observed just below the right inguino-crural fold, and the patient stated that it was due to a wound from a fragment of shell, which had been buried for fourteen days in the tissues; on its extraction free bleeding occurred, but was checked by a plug of amadou; a few months afterward he felt the limb weak, and the above-mentioned condition ensued. (This case is entitled "*arterial* and venous obliteration;" but it would seem as if the vein had been chiefly concerned.)

Maclean,⁶¹_{June 20} reports a case of traumatic aneurism in Scarpa's

triangle, in a boy, aged ten, cured by the old operation of emptying the sac and tying above and below; the aortic compressor was used to advantage.

He reports another instance of traumatic (pistol-wound) aneurism of the common femoral, in a boy, aged fourteen, treated successfully by ligation of the external iliac.

Keeling²²_{Mar. 14} reports the case of a man, aged forty-six, in whom a simple fracture of the thigh was attended with rupture of the internal and middle coats of the artery, and gangrene of the leg ensued, necessitating amputation. Mudd, of St. Louis,⁸²_{Feb. 18} reports a case of fracture of the femur with rupture of the artery and vein; gangrene had begun when he saw the patient, and he amputated successfully above the site of the injury. Potherat⁷_{Mar.} reports a case under the care of Trélat, in which a contusion of the femoral artery, rupturing the internal coat, caused gangrene of the leg and amputation; the patient, a man, aged twenty-nine, free from syphilis or alcoholism, made a good recovery.

Walsham²_{Mar. 31} gives the history of a medical student, aged nineteen, wounded in the thigh with a knife; an arterio-venous aneurism formed in Hunter's canal, which was explored, and the vessels tied above and below, with a successful result. An interesting discussion is reported in connection with the case.

Decamps⁷_{June} has presented to the *Société d'Anatomie* a specimen of arterio-venous aneurism in Hunter's canal, from a man, aged eighty-one, wounded by a knife sixteen years previously. There were two distinct sacs, one arterial and the other venous.

Kirmisson¹⁰⁰_{Jan. 14} has published a lecture upon the case of a woman, aged fifty-six, admitted to the Hôpital Necker on account of an aneurism just below Hunter's canal, caused by thrombosis; the symptoms were weakness, œdema, and swelling of the limb, followed later by pain, coldness of the foot and leg, and ecchymosis. The treatment proposed was the application of the Esmarch bandage, and, in case of failure with this, ligation of the superficial femoral artery.

Bucquoy¹⁴_{July 4} relates a case in which a woman, aged thirty-three, had, after her fourth confinement, an embolism of the femoral artery at the groin, causing aneurism. Electro-puncture was tried without success; Moore's method, with wire, also failed; and then Baccelli's, with watch-spring, was employed twice at an

interval of three weeks. This also was unavailing, and about two months later the patient died with eclampsia. Besides other lesions, hæmorrhagic infarcts were found in the brain, liver, and spleen.

Knox²¹³ reports the case of a man, aged thirty-nine, with a history of syphilis, in whom an aneurism in Hunter's canal had ruptured; it was treated according to the old method, a ligature being applied above, the tumor laid open and emptied, and two ligatures applied below. The result was good.

Championnière,³ showed to the *Société de Chirurgie* a patient who had had an arterio-venous aneurism in the popliteal space successfully treated by ligature above and below.

Hochenegg⁸ gives an account of a singular case. A man, aged forty-one, had been struck by a bullet in the knee in 1878; it was supposed that the missile had dropped out from the limb during his transportation to hospital. For ten years he suffered more or less constantly, when a swelling with pulsation was detected at the inner side of the joint. This being laid open, a false aneurism was found to exist, caused by the presence of a spiculum of bone, along with the bullet (from a Snider gun), which had lodged there when he was first injured. The vessels were tied above and below and the wound plugged with iodoform gauze. An excellent cure resulted.

In connection with this case may be mentioned one recorded by Küster, of Berlin,⁴¹ of traumatic aneurism of the popliteal artery from the pressure of an osteophyte from the posterior surface of the tibia, in a man aged eighteen. Ligation above and below, with exsection of the included portion of the artery and removal of the offending piece of bone, were resorted to, and the patient made a good recovery.

Rostosbinsky, of Tambov, Russia,¹⁰⁹ reports a case of popliteal aneurism occurring in a man, aged thirty-two, free from syphilis or alcoholism. Forced flexion having failed, digital pressure was resorted to, and at the second trial proved successful. The lesion seemed, perhaps, to have been directly or indirectly connected with a compound fracture of the leg, sustained by the patient in early life.

Kangaroo-tendon, tied with a clove-hitch, was successfully used by Lunn in securing the superficial femoral artery, in a case

of popliteal aneurism in a woman, aged forty-five, and a similar experience, in the case of a man, aged twenty-seven, is recorded by Keetley.²

Knox and Beatson²¹³ report a case of double, or rather bilateral, popliteal aneurism, occurring in a man, aged thirty-two, with syphilitic antecedents. On one limb pressure was successfully used, but the patient would not allow it to be applied in the other, and the Hunterian operation was performed with good result.

Cauchois²⁰³ gives the history of a case in which, an aneurism existing in each popliteal space, ligation of both arteries was performed, the left one being tied on February 3d and the right one on March 11th. Subsequently there was atrophy, ulceration, and diffuse suppuration in the left leg, and finally hæmorrhage from the old aneurismal sac; so that on October 23d amputation was performed through the middle of the thigh. The deep femoral artery was found largely developed. The patient, a man thirty-eight years old, was apparently free from syphilis or alcoholism. Cauchois says that he has been able to find but four published cases of bilateral popliteal aneurism; yet it seems as if the condition could hardly be so rare as this would indicate. I have myself met with one case, in which I tied the superficial femoral on one side, and some months later my colleague, Dr. John Ashhurst, tied the other. Certainly, given the condition of the arterial system which favors the formation of aneurism, both popliteal arteries would be as likely to be affected as non-symmetrical vessels. Such a case is no more remarkable than any other of multiple aneurism.

Jackson, of Sheffield, England,²² reports the case of a boy, aged fourteen, with a large lacerated wound behind the knee. Extensive suppuration ensued, and finally hæmorrhage; amputation was performed, but the patient never rallied. It was a question here whether the artery was contused, and thus weakened, at the time of the injury, or merely gave way by ulceration.

Battle,⁶ is reported to have had to treat at St. Thomas' Hospital a man, aged twenty-six, who had a large, non-pulsatile, tense, painful, fluctuating swelling of the left calf of three weeks' duration. It was found to be an enormous false aneurism from ulceration of the posterior tibial artery at its upper part. The vessel was tied above and below, and the intervening portion excised; a ligature was also placed on the anterior tibial artery. Much tissue

sloughed out from the seat of the wound, but the circulation of the limb was well maintained, and a cure was expected.

Peabody⁵⁹ presented to the New York Pathological Society a specimen of traumatic aneurism of the posterior tibial artery, following the lodgment of an embolus in that vessel. The patient was a man, aged twenty-two, a nurse, and had not been aware of extensive head-lesions with which he was affected, as shown by an autopsy.

Jamison, of New Orleans,¹² reports a case of traumatic aneurism, diagnosed as one of the anterior and posterior tibial, operated upon by ligation of the popliteal; pulsation having returned, the posterior tibial was tied without benefit, and finally a distal ligation of the anterior tibial proved effectual.

Whitson, of Glasgow,⁶ reports a case of accidental knife-wound at the upper and inner part of the leg, in a man, aged fifty-six; very free bleeding ensued, and the wound was enlarged, when it was found that the knife-edge had made a slit of some size in the wall of the posterior tibial artery, as well as in both venæ comites. Ligation of each, above and below, was effected, and the division completed with scissors; several small twigs were also tied, and the wound closed, bone drainage tubes being employed. A good recovery ensued.

Hochenegg¹¹³ reports the case of a man, aged twenty-one, who was admitted into hospital with what was supposed to be an aneurism of the left ulnar artery. Under elastic strapping and digital compression this disappeared, when a new pulsating swelling was found at the back of the left inner malleolus. Before this could be dealt with, the patient died suddenly from the bursting of an aneurism of a mesenteric artery. The patient had had rheumatism four years previously, with resulting mitral incompetence. Professor Paltauf explained this case as one of multiple aneurism, due to "endocarditis verrucosa et bacteritica," and quoted four similar cases observed by himself and seven by Eppinger. Cocci in abundance would be found in the thrombi formed under such circumstances.

Walsham,⁶ has noted a case of traumatic aneurism of the internal plantar artery following the operation of section of the plantar fascia for talipes equino-varus. The artery had been wounded, and the child was allowed to walk about before union had occurred. A cure was effected by pressure.

It may be of interest enough to be mentioned here that Sir H. Keating, a distinguished English judge, who recently died, had had his external iliac artery tied for femoral aneurism thirty years ago, by Sir William Fergusson.²_{Oct. 18}

Venous System.—Lazarus, of Berlin,¹⁹_{Jan. 14} has put on record a case of varicose dilatation of veins on the dorsum of the tongue. No explanation of their occurrence is offered, but the condition would seem to be allied to that of nævus, as sometimes met with in children.

Vaudey, of Marseilles,⁴⁶_{May 30} reports a case of suicidal wound of the right internal jugular vein, in a man, aged forty-eight. Ligation above and below was practiced with success.

Reynier⁹¹_{Aug. 10} has reported a case in which he ascribed the death of the patient to entrance of air into the internal jugular vein after an operation for the removal of enlarged cervical glands. Nicaise and Terrier, however, doubted the correctness of this explanation.

Dr. Meyer, our corresponding editor in Naples, communicates a rare case which recently occurred in the practice of Professor Lipari: The patient, a man, aged forty-eight, was affected with carcinoma of the liver, and suddenly fell into profound collapse, which proved fatal. At the autopsy, the inferior vena cava was found enormously dilated and its wall thinned. In consequence of the steady growth of the tumor, tension had been put upon the vessel, and at length the wall, stretched to its utmost, gave way under the pressure of the blood-current, with fatal result.

Tripier⁶⁷_{June 15},⁶⁴_{Sept.} describes visceral varices, which he thinks often occur, and would, if recognized, account for various morbid phenomena. He recommends the use of the tincture of *carduus marianus* (milk-thistle) as a valuable remedy in such cases, but one cannot help thinking that treatment on general principles would be more reliable than the employment of any one article on empirical grounds.

Quenu⁷³_{Feb. 11} calls attention to the frequency with which, in connection with varicose veins, sciatica and other neuralgias are observed, and ascribes these symptoms to irregular distentions of the veins contained in the substance of the affected nerve-trunks. In the discussion⁷³_{Feb. 18} of this proposition, it was argued against by Berger and Le Dentu, but Verneuil, Schwartz, and Trélat gave it more or less positive support.

Von Koretzky, of St. Petersburg, ¹³_{May 15} having had occasion to tie the femoral vein immediately below Poupart's ligament, with success, took up the study of the subject, and from the recorded cases, as well as from experimental research, confirms Braun's view, that this operation is dangerous—even more so than ligation of the external iliac vein.

A case of traumatic venous aneurism is recorded by McLeod, of Calcutta. ²⁰⁸_{Sept.} A Hindu male, aged twenty, was wounded in the right forearm, just below the bend of the elbow, by a fragment of a bottle which burst near him. A few days afterward a swelling formed and increased rapidly. It was laid open, and a quantity of blood and clots turned out, when it proved to be a false aneurism, into the cavity of which there were two openings, the proximal and distal orifices of a vein. Underneath each of these a catgut thread was passed, and tied. The wound was then cleansed and closed. Perfect recovery ensued.

Schwartz ³⁵_{Feb. 2} confirms the prevailing view that superficial and deep varices almost always co-exist. He reports three cases treated by multiple ligation and extirpation, which he recommends whenever other treatment fails to give relief, especially in young persons.

Ormsby ²²_{July 4} reports two cases of varicose veins successfully treated by acupressure. Eight pins were used in one case, and six in the other.

I have myself used acupressure, with a very satisfactory result, in a young man who, in consequence of an injury, had largely distended veins at the inner side of one knee. Three pins only were used, with full antiseptic precautions.

Kobert ⁶⁰_{Nov. 17} recommends a mixture containing chloride of barium, with distilled water, lanolin, and oil of sweet almonds, for the local treatment of varicose veins; the application is made by rubbing, thrice daily. It is doubtful whether this could be of any avail without other measures. Bartholow, ⁹_{Feb. 23, '89} however, speaks of the chloride as being of service in this affection.

FRACTURES AND DISLOCATIONS.

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FRACTURES.

IN the general treatment of fractures it is to be noted that massage appears to have gained considerably in favor during the year on the Continent of Europe, at least in the treatment of fractures near joints, and especially in those of the lower end of the radius and of the leg near the ankle. Most of those who have written in its favor of late do not go quite so far as the earlier adherents, but advise that the limb should be kept in splints and that the massage should be used to favor absorption of the extravasations and to diminish the tendency to stiffness of the joints. With this limitation the measure is more likely to be favorably regarded and to be employed in cases in which the necessary time and attention can be given and in which the shortening of the period of convalescence is greatly desired.

Rainal frères, of Paris, ²⁴_{Mar. 18} have introduced plaster-of-Paris splints, so prepared that they can be fitted for immediate use by moistening with a sponge. The details of structure are not given, beyond the facts that the splints are made of some textile fabric, cut to suitable shapes, and filled with dry plaster. They are kept for use in tightly closed tin boxes. Similar splints have occasionally been made, when wanted, by cutting a dozen layers of crinoline in the proper shape and filling them with a thick plaster cream, but the inconvenience of this mode of preparation is so great that complete encasement of the limb in a dressing made of the prepared rollers has almost entirely superseded it, although the splints are free from some of the disadvantages of the latter. Such prepared splints would be of great convenience in hospital and dispensary practice.

McKell ⁵³_{Feb. 11} highly recommends a method of preparing a similar splint which may prove more convenient than plaster. He soaks a piece of stout cloth in the following solution: gum-shellac,
(G-1)

one pound; borax, one drachm; alcohol (98 per cent.), one pint. The cloth is washed, thoroughly dried at a high temperature, painted with the shellac solution until saturated, and then applied to the limb. It can be made to open by leaving a narrow strip along the centre unpainted. It can be punched with small holes for ventilation. It is said to be perfectly rigid at any temperature below one hundred degrees.

Fracture of the Ribs.—S. A. Fisk⁹⁹ reports a case of fracture of the tenth rib caused by a sudden violent cough. The fracture was on the right side and at a distance from the spine equal to about one-third of the length of the rib. The symptoms were crepitus on deep inspiration or on manipulation of the rib, and intense local pain on moving or coughing.

Fracture of the Sternum.—Three cases of this infrequent accident have been reported during the year, two by Porter and Lyman⁹⁹_{Apr. 12} and one by Burnett.²²_{Apr. 11} In the first the fracture was at the junction of the second and third pieces of the gladiolus with displacement of the upper fragment backward, and had been caused in a game of foot-ball by a blow from the knee of an opposing player, who was running with the ball and jumped as the patient sought to “tackle” him. There was profound shock and agonizing pain. In the second case the patient fell while running and struck his breast against the end of a railroad tie; there was much pain and crepitus at each breath or movement of the body. In each case the attempt to reduce by dorsal flexion of the trunk failed, and in each spontaneous reduction took place as the patient coughed, in the former while he was lying quietly in bed, in the latter while the shoulders were being again drawn backward. In the third case the patient had been killed by being crushed between a hoist and a wall; the fracture “was very oblique from above and in front downward and backward. Its upper border passed across between the cartilages of the second ribs, while its mediastinal margin was placed below the level of the third pair of ribs. The second and third ribs of both borders were also broken, and on the right the fourth and fifth also.” The trachea was ruptured transversely, and the œsophagus bruised but not torn. Apparently the rupture of the trachea had been caused by direct pressure upon it downward and backward close above the sternum.

Morton²²_{May 23} relates a case that had been observed by the late

Dr. Kittson, in which the depression had been overcome by a device that has occasionally been suggested but always dismissed, I believe, as theoretically useless, that of making traction upon the depressed fragment by means of a cupping-glass applied to the skin.

Fracture of the Humerus.—Pollosson⁹¹_{Nov.} reports a unique case of crushing *fracture of the head* of each humerus, apparently caused by muscular contraction during convulsions. Each bone showed a grooved depression about one inch long and one-fourth inch deep on the anterior part of the head just above the lesser tuberosity. The articular cartilage lined the depression and was fissured; the underlying bone was crushed and infiltrated with blood.

In a case of *separation of the upper epiphysis*, Helferich⁸_{Apr. 11} cut down upon the fragments, reduced the displacement, and fastened the pieces together with a long steel pin, which was left in place for a fortnight. The patient made a good recovery. In the discussion that followed the presentation of this case to the Society of German Surgeons, Bruns reported two cases and Woelfler one of separation of the epiphysis or fracture with dislocation of the head successfully treated by excision of the upper fragment.

I_{June 20}¹ presented to the New York Surgical Society a specimen of a rare fracture of the lower end of the humerus, the lower fragment consisting almost exclusively of the trochlea and capitellum, separated from the shaft by a transverse vertical line of fracture which began on the front of the shaft half an inch above the coronoid fossa and ran downward and slightly backward to the back of the epicondyles, entering the olecranon fossa close beneath the junction of its upper and anterior surfaces. The lower end of the upper fragment was shaped like an inverted Y, the two branches of which were formed by the supracondylar ridges, the interval between them corresponding to the olecranon fossa. The displacement was slight.

In the French Surgical Congress and the German Surgical Society several surgeons spoke strongly in favor of the treatment of fractures of the lower end of the humerus, whether supracondylar, T-shaped, or of either condyle, in the extended position of the elbow. Berthomier⁹¹_{Apr.} claimed complete restoration of the

mobility of the joint obtained in seventy cases by this method. He recommends that the limb should be kept extended and supinated upon a splint for from four to eight days, then placed in a silicate dressing which is to be divided on the sixteenth day to permit gentle passive motion, and finally removed from the splint at about the end of the fourth week,—twenty-fifth to thirtieth day.

Lauenstein⁴¹_{Apr. 19} said he had been led to adopt this method by examining post-mortem a case of supracondylar fracture which had been treated in the flexed position and had become ankylosed; he found that the flexion had taken place at the fracture and not in the joint. Since that time he had treated all fractures at the elbow in the extended position, and with very satisfactory results. In the discussion that followed König said he had long employed the method in hospital practice, but had some objections to its use with out-patients. Bardenheuer had used it for the last five years, because he had found that the flexed position favored displacement.

On the other hand, Powers⁵⁹_{Dec. 22} reports forty cases treated at the Chambers Street Hospital, N. Y., in the flexed position with a plaster-of-Paris dressing, in almost all of which the result was complete restoration of form and function.

This method was warmly recommended several years ago by Dr. Allis, of Philadelphia, in the treatment of fractures of either condyle, as the only one that would surely prevent the usual "gunstock" deformity. I have frequently employed it and have noted only one defect—the occasional tendency of the fractured condyle to be displaced forward. In employing it the surgeon should be careful to reproduce the normal outward deviation (abduction) of the forearm.

Fracture of the Head of the Radius.—Powers⁵⁹_{Feb. 25} reports a case of this rare injury observed clinically; the diagnosis was made on crepitus perceived on rotation of the forearm while the head of the radius was pressed upon, and on independent mobility of the inner and outer halves of the head when the inner half was fixed by pressure and the outer half was moved with thumb and forefinger. The patient recovered with a useful limb.

I reported¹_{Nov. 24} a case of fracture of the *head of the radius* and of the *coronoid process*, apparently produced by violent pressure

of the flexed forearm backward against the humerus. The condition of the bone was demonstrated by arthrotomy. The coronoid process was broken off at its base, the head of the radius was split in the median plane, and the inner half was broken into two pieces, one of which was displaced forward and lodged in the anterior ligament. The front part of the neck was crushed in such a way that the upper surface of the head formed an oblique angle with the shaft.

Fracture of the Coccyx.—Dr. W. J. Jolly⁵⁹_{Dec. 17} reports the following case: “I was called to see Mrs. M——, November 1, 1887, primipara, aged twenty-one, who was in labor. Nothing unusual occurred until the head pressed against the coccyx, which did not yield. I applied the forceps, and delivered the woman without any trouble or laceration of perineum. Immediately after delivery she suffered intense pain in the region of the coccyx, for which I gave an opiate. On examination I found some displacement of the coccyx, which I corrected, supposing the bone to be fractured. The opiate soon relieved the pain, and the patient did not suffer any more until the ninth day, except that there was some tenderness in this region. She had some slight pain on that day. On the tenth she passed a bone per anum and sent it to me, stating that she thought she had passed a joint of her backbone. Upon examination I found it to be the lower segment of the coccyx. The woman has had no trouble since.”

Fractures of the Femur.—Cauchois²⁰³_{Aug. 1} presented a specimen of a unique form of fracture of the *upper end* of the femur. The patient had committed suicide by jumping from the second story of a building. “The upper extremity presents a separation into two fragments prolonged along the anterior and posterior surfaces [of the shaft] and involving the extra-articular portion of the neck, and between them the body of the bone forms a third fragment vertical from below upward upon the outer border of the bone.”

Loreta²_{Aug. 25} operated upon a man thirty-six years old who had received an injury of his left hip nineteen months previously and had remained completely disabled and suffering greatly. A long incision was made behind the great trochanter and carried down to the capsule, and it was then discovered that there was a fracture without displacement at the junction of the intra- and extra- capsular portions of the *neck*. The fibrous tissue between the

fragments was divided, the ends of the bone freshened by scraping, and a bundle of wires placed between them and brought out at the lower angle of the wound. Five days later the wires were removed; the wound healed by first intention. In less than a month the pain had entirely ceased, and in fifty-five days the patient left the hospital, able to walk.

Lydston⁹ relates the case of a man thirty-five years old who slipped while walking, and in the effort to avoid a fall heard a snap and felt something give way in his left thigh. The femur was found to have been broken at the junction of the middle and lower thirds.

Fracture of the Patella.—The publications upon this subject during the year have been comparatively numerous, and most of them have dealt with the method of treatment by metallic suture, either as a report of cases or as a formal study of the method and attempt to formulate the indications for its use. Two interesting papers on the relation of the character of the union to the functions of joint and on the mechanism of fracture have been published by Villar⁷ and Chaput.⁷

The more noticeable formal papers on the treatment by open arthrotomy and wiring are those of J. Wm. White,⁵⁹ J. S. White,¹⁵⁷ and Kirmisson.¹⁰⁰ The cases that have been reported are, as is usual, the successful ones. I know of three unpublished cases operated upon in a New York hospital during the early summer, all of which came to amputation, and two, at least, ended fatally. A case of compound fracture of the patella caused by a blow with an axe, treated by wiring under full antiseptic precautions, is reported by Dr. A. H. Ferguson, of Winnipeg, a collaborator of the ANNUAL. Erysipelas set in on the fourth day, profuse suppuration followed, and the limb was amputated about a month later. In speaking of this subject a year ago, attention was called to the protests against the method uttered by many experienced and esteemed surgeons, and it may now be said that as a treatment for recent simple fractures it has ceased to be employed in Germany and France, and that in England and America it is employed by comparatively few of those surgeons whose authority is widely recognized. The greater danger of the operation in old, ununited fractures, for which, also, unfortunately, there are no efficient alternative measures, has been thoroughly proved, and J. W. White's

opinion, that the disability should be great before the surgeon should venture to recommend the operation, should, we think, govern practice.

Various alternative measures or modifications have been suggested or employed. Ceci³⁰¹ has successfully employed in several cases a method of subcutaneous wiring. The fragments are held together and a drill is passed through the bone from the inner lower to the upper outer angle, threaded with silver wire, and withdrawn; the lower end of wire is then carried by the drill across below the lower end of the bone and brought out through the skin at the lower outer angle, and then, by drilling from the upper inner to the lower outer angle it is carried again through the bone to its upper inner angle, and then under the skin close above the upper border of the bone to meet the other end of the wire at the upper outer angle. The two ends are tightly twisted together, cut short, and buried beneath the skin.

Axford⁹⁶ proposes that the bone should be drilled longitudinally at two points, wires passed, and the ends of each twisted together over the front of the bone. The editor of the *Medical News* (September 15th) points out that this proposed plan is essentially the same as advocated by T. G. Morton, who passed two drills in the same way and placed upon each end a clamp by which the fragments were kept from separating.

It seems unnecessary to resort to drilling of the bone if the fixation can be effected by sutures which do not enter the joint. Some years ago Volkmann passed a loop of silk through the tendon of the quadriceps and another through the ligamentum patellæ, and fixed the fragments by tying the two loops together over the skin and an interposed pad of gauze. I have successfully employed in four cases a modification of this method suggested by E. W. Clark, House Surgeon at the New York Hospital, in which the ligature is passed subcutaneously and left buried under the skin; it is first carried through one tendon by a strong curved needle, then by a long straight needle between the skin and the front of the patella, then through the other tendon, and back to the first point of entrance, where it is tied and cut short. Punctures for the entrance and exit of the needles should be made with a knife in order that the silk may be fully buried at the angles.

Several excellent results obtained by massage, with early use of the limb, as recommended by Tilanus, of Amsterdam, have been reported. Under this treatment it is claimed that the primary separation diminishes or may entirely disappear, and that complete functional restoration is promptly obtained.

Wm. K. Otis¹_{Dec. 21, '97} has devised an ingenious modification of Malgaigne's hooks, in which the prongs are made almost straight, and each pair can be moved along the central bar and fixed by a thumb-screw.

Bergmann's plan of approximating the fragments in old cases by chiseling away the tuberosity of the tibia with the attached ligamentum patellæ, instead of dividing the tendon of the quadriceps, has been employed successfully by Sonnenberg.³³⁶_{Nov. 24}

Fracture of the Tibia.—Two cases of avulsion or fracture of the tuberosity of the tibia with the attached ligamentum patellæ have been reported by Müller and Lauenstein.¹⁰¹⁷_{Ed. 3, H. 2; Sept. 27}⁸ In one the fragment and the patella were displaced two centimetres upward, in the other the fragment could be moved with crepitation but was not displaced. The patients were sixteen and eighteen years old, and both were injured while exercising in a gymnasium. The fragments were secured in place by adhesive plaster and gypsum dressings, and complete recovery followed. Six other reported cases are quoted in the article.

Two more cases of the rare traumatic separation of the upper tibial epiphysis are reported by Heuston,²_{July 21} and Manby.²_{Sept. 22} The patients were eight and twenty years old; the injury was caused in the former by the effort to free the leg, which was caught between two desks, and in the latter by a fall from a bicycle.

Fracture of the Upper End of the Fibula.—Three cases of this rare injury with resultant disturbance of innervation in the distribution of the external popliteal nerve have been reported by Weir,¹_{May 26} Blin and Damaye,²¹²_{Sept.} and Marchant.⁴¹⁵_{Sept. 15} In the first and third cases there was also a partial dislocation of the knee. In the first case the fracture was exposed by incision, and the nerve was freed from its attachments to the upper fragment; improvement was obtained, but not a complete cure. In the second, treated by Charcot at La Salpêtrière, a cure was effected by the use of static electricity. In the third the nerve was found to be surrounded by the callus thrown out about the fracture; this was removed, and

the motor and sensory troubles disappeared in the course of seven months.

In another of fracture of the upper end of the fibula by gunshot, in which the wound had suppurated for eight months, Heydenreich³_{Apr. 4} cut down upon the nerve and found the anterior tibial nerve fixed by a mass of cicatricial tissue to the fibula, and red, swollen, and infiltrated for a distance of two inches. It was freed from its adhesions, and the patient recovered. His symptoms had been persistent pain and cramps in the leg, recurrent lancinating pain extending to the first three toes, abolition of sensation in the distribution of the anterior tibial and musculo-cutaneous nerves, and diminution of function in the muscles of the leg, especially the anterior and peroneal ones.

Fracture of the Os Calcis.—Gussenbauer⁸⁸_{No. 18} reports a case of fracture of the os calcis in which the tuberosity was broken off and displaced two inches upward by the traction of muscles of the calf. Reduction was made under anæsthesia by drawing the fragment downward with a sharp hook, and its retention was secured by fixation with a nail, which was left in place for six weeks. Complete recovery.

DISLOCATIONS.

Dislocation of the Ribs.—Quint¹⁸¹_{June} reports an example of this extremely rare injury—dislocation of the vertebral end of the first rib. The patient, a lad thirteen years old, fell under a wagon in such a way that, while lying upon his breast, the wheel passed over the right shoulder and along the right side of the chest; he died in forty-eight hours with intense dyspnœa and cyanosis. The second, third, fourth, and fifth ribs were broken near their angles; the first rib was not broken, but its vertebral end was completely detached from the first dorsal vertebra, and was dislocated upward; the stellate and interosseous ligaments were destroyed. The lung was lacerated at several points and collapsed.

Dislocation Upward of Sternal End of Clavicle.—Evans⁴⁰_{Mar.} reports a case of this rare injury. The patient had been struck upon the back by a heavy piece of timber, which broke two or three ribs below the right scapula and dislocated the inner end of the right clavicle upward and inward. “The head of the bone could be fairly well defined in the suprasternal notch, and the

sternal tendon of the sterno-mastoid was tightly notched over it, forming quite a distinct prominence. It was easily reduced by drawing the shoulder outward and backward, while the head of the bone was pressed into position. No apparatus was applied, and it remained well in position until death. The shoulder was driven inward and forward by the blow." The lung had been wounded, and the patient died thirty-six hours after the accident.

Dislocations of the Shoulder.—Ory²⁴ reports a case of dislocation of the shoulder by *muscular action*. The patient, a muscular youth, nineteen years old, struck with his fist at another man standing in front and to the outer side of him. The blow missed its object, great pain was felt in the shoulder, and on examination a subcoracoid dislocation was found. It was easily reduced by Lacour's method, in which the arm is raised horizontally in front and then rotated outward.

Evill⁶ reports another case of dislocation of the shoulder *without rupture of the capsule*. The patient died twelve days after the accident, apparently in consequence of an associated compound fracture of the elbow. The capsule was lax and slightly raised at its attachment to the anterior border of the glenoid cavity, but was still continuous with the periosteum. There was a well-marked groove on the posterior surface of the head of the humerus, thought to have been produced by forcible impact against the exterior edge of the glenoid cavity.

A case of supposed *dislocation upward* in front of the acromion is reported by Robson,⁹⁶ but the description and the plates are so incomplete, and in some respects contradictory, that the diagnosis cannot be accepted without reservation. The patient was a boy, sixteen years old, whose right arm had been pulled violently upward and backward. An attempt had been made to reduce under chloroform an hour after the accident. He came under Mr. Robson's care six weeks later. "There was a large, hard, slightly irregular, rounded swelling, about a finger's breadth, in front of the right acromion and immediately to the outer side of the coracoid process. On viewing the shoulder from the front a depression was seen immediately beneath the acromion, and again below this a rounded elevation, apparently due to the closer approximation of the fibres of the deltoid. The bony prominence moved with the shaft of the humerus, . . . so that there was no doubt of

its being the head of the bone. The arm could be readily placed against the side of the chest with the hand touching the opposite shoulder. If the scapula was not fixed it moved with the arm, but if fixed the arm could be moved from the side to an angle of thirty degrees. The tips of the fingers could be placed on the occiput. The arm could be moved anteriorly to an angle of forty-five degrees, further movement being limited by the contact of the head of the bone with the acromion. In a backward direction the movement was not limited. Rotation outward was prevented by the head of the bone coming in contact with the acromion. The position of the clavicle and coracoid process was normal. The supra- and infra- spinous fossæ were more flattened than on the left side.

Measurements: Circumference, taken by passing a tape under the axilla and over the shoulder, was fourteen and a half inches, being equal on both sides. Acromion to internal condyle, right, ten inches; left, eleven and three-eighths inches. Head of humerus to internal condyle, right, twelve inches; left, twelve inches.

After failing to reduce under ether by manipulation and traction, "Mr. Robson exposed the joint by an incision of four and a half inches on the outer side of the shoulder, the incision being convex anteriorly and extending quite down to the bone. It was then discovered that, in addition to the dislocation of the head of the humerus, there was a longitudinal fracture separating the greater tuberosity from the head and extending down the shaft for some distance beyond the line of incision. On rotating the arm crepitus could be obtained. Reduction could not be effected in consequence of the glenoid fossa being filled with callus and plastic material thrown out around the fracture." The wound healed kindly, and six weeks later the patient "had a good range of movement of the arm."

There seems to be some reason to believe that the injury may have been a separation of the upper epiphysis of the humerus, especially as it does not clearly appear that the incision made a thorough examination of the parts possible.

Le Fort,⁸ reports a case of dislocation of both shoulders at an interval of three weeks, during sleep, presumably the result of epileptic attacks.

Two cases of *compound dislocation* of the shoulder with

recovery without operation are reported by Edward Smith¹³⁵ and D. Benjamin.¹⁹_{June 16} In the former the head of the humerus was forced through the skin of the axilla and through the patient's clothes; after reduction and prolonged suppuration the patient recovered with complete ankylosis. In the second the patient fell under a freight-car and sustained, in addition to a compound dislocation of the left shoulder, compound fractures of the first phalanges of all the fingers and thumb and of the first four metacarpal bones of the right hand, a compound fracture of the left humerus in the upper third, and a simple fracture of the left clavicle; the left upper part of the thorax was contused, and there was bloody expectoration. The patient was able to sit up by the latter part of the second month, and "is now employed as a piano-mover and has perfect use of both arms."

A. M. Sheild,²_{Mar. 7} reported a case of subcoracoid dislocation of the shoulder of twelve weeks' duration, with such pressure upon the nerve-trunks that the hand was almost useless, in which he restored the limb to usefulness by *excision of the head of the humerus*, the line of section passing through the anatomical neck. No attempt was made after the excision to restore the bone to its normal position.

For *habitual* dislocation of the shoulder Yeates,⁶_{June 20} recommends an apparatus of which he had made very satisfactory personal use. It consists of an arm and side splints made of metal and joined together by a ball-and-socket joint set in a metal bar shaped like a crutch, which fits in the axilla. The arm is thus limited in its movements in all directions to what is considered a safe distance by the ball-and-socket joint.

Bouygues,⁴_{May} reports an interesting autopsy in a recent dislocation (ten days) of the shoulder in a patient seventy-two years old. The anatomical neck rested against the upper part of the axillary border of the scapula, the upper part of the head being covered by the tense fibres of the subscapularis; the capsule was detached from its insertion upon the anatomical neck and torn at its lower interior part, and the head passed through the rent to come into contact with the axillary vessels and nerves and compressed them against the tense suspensory ligament of the axilla. This pressure, which has not heretofore been noted, was sufficient to indent the nerve-trunks and produce small ecchymoses in them and to cause

the formation of a thrombus which filled the axillary vein. The upper and middle facets of the greater tuberosity were broken off.

Dislocations of the Elbow.—Petersen¹⁸⁸⁶_{Apr. 14} finds an explanation of the relatively greater frequency of dislocations of the elbow in children and women in the normal hyperextension of the joint which exists in them, but is absent in most adult males. He thinks that the patient falls upon the outstretched hand with the elbow hyperextended, in a position, that is, which permits the hyperextension easily to be increased, and thus the lateral ligaments which receive the strain are torn and the bones are forced backward and upward. It is easy to confirm his statement that hyperextension is common in children, and it is also well known that backward dislocations of the elbow can be easily reduced by moderate traction upon the hyperextended forearm.

Ollier²¹¹_{Mar. 11} reports a case of successful reduction of a backward dislocation of the elbow that had existed fifty-four days by open division of the adhesions through two lateral incisions and by subcutaneous division of the triceps and its aponeurosis just above the olecranon. He recommends that the method should be tried in all cases four or five months old.

The same surgeon²¹¹_{May 20} reports a case of extensive ossification of the periarticular tissues following a dislocation of the elbow that had been reduced, the effect of which was to cause complete immobility of the joint. There was a bony mass in front of the joint measuring six or seven centimetres, another large one due to ossification of the posterior ligament, and laterally the ossification had invaded the lateral ligaments and the capsule. Ollier thinks the cause of such ossification, which he had observed in less degree in several cases, is to be found in prolonged and repeated efforts to reduce the dislocation and the resultant laceration of the soft parts, and also in too early and injudicious movements of the joint after reduction. The age of the patient is not given. I have reported three cases of voluminous deposit of bone at the back of the external condyle in unreduced dislocations in children, the formation being plainly due to the productive activity of the stripped up periosteum. Such productions of bone and the early filling of the sigmoid fossa with fibrous tissue oppose insuperable obstacles to reduction, except by arthrotomy, and it cannot even be expected that arthrotomy will always be as successful as in

Ollier's first case above mentioned. In some cases excision of the end of the humerus is the only means by which a movable joint can be formed.

Dislocation of the Proximal Phalanx of the Thumb.—This dislocation, so often difficult of reduction, has been the subject of a considerable number of publications during the year, and several cases of successful resort to open arthrotomy have been published. The importance of preserving and even exaggerating the dorsal flexion of the phalanx and of reducing it by propulsion along the back of the metacarpal bone instead of by traction upon the thumb, appears to be generally understood, and the cases of *complex* dislocation now encountered, those, that is, in which the anterior ligament had been forced between the articular surfaces by flexion of the phalanx, are mainly those that have been first subjected to the well-meant but unskillful efforts of non-professional friends. The combination of rotation, first to one side and then to the other, with propulsion, in order to turn the two heads of the short flexor around the head of the metacarpal bone successively instead of simultaneously, has yielded several successes, and in one "complex" case which had resisted the intelligent application of the usual methods, Guermonprez¹⁰⁰_{June 19} reduced by his own method of prolonged traction in the axis of the metacarpal bone followed by rotation.

Among the cutting methods the only novelty is that of Thomas,²⁶_{Aug. 1} who makes an opening on the palmar aspect of the joint with a strong tenotome and then introduces through it a narrow, slightly curved metal lever, the end of which he passes between the bones to rest against the articular surface of the phalanx and thus furnish a support along which the bone can be pushed into place.

Bessel-Hagen²²⁶_{v. 37, p. 386} reports a unique case of *lateral* dislocation of the proximal phalanx of the thumb to the ulnar side of its metacarpal, caused by bending of the member to the radial side. The thumb appeared shortened, abducted, in slight apposition, and flexed at its interphalangeal joint. Reduction was easily made by traction and pressure.

Dislocation of the Scaphoid.—Stewart⁵⁹_{Oct. 6} reports a case of dislocation of the carpal scaphoid by a fall upon the hand. No details of the symptoms are given, except that there was a tumor

on the dorsal surface of the wrist, and that he "could easily define the outline of the scaphoid bone." Reduction was made by fraction upon and adduction of the hand, with pressure upon the displaced bone.

Dislocation of the Hip.—Baker⁹⁰ reports a case of reduction by Dr. Thorndike of a backward dislocation of the femur that had existed for eleven months. The patient was a woman nineteen years old; the dislocation was a spontaneous one, having occurred five weeks after confinement, and having been preceded by severe pain in the hip and thigh. The reduction was effected by manipulation and traction with the hand alone. The limb appeared to be slightly shortened, but the patient was able to walk well.

Dislocation of the Semilunar Cartilage of the Knee.—At a meeting of the Clinical Society of London², Croft exhibited a patient upon whom he had successfully operated a year previously by Annandale's method. In the discussion that followed, successful cases were reported by Annandale, Davies-Colley and Allingham. Annandale's operation consists in an incision around but a little below the upper articular surface of the tibia; the articulation being exposed and all bleeding stopped, the capsule is opened and the cartilage drawn forward with a blunt hook and fixed by two or three stitches to the capsular ligament and head of the tibia.

Dislocation of the Patella.—A case of habitual dislocation of the patella outward, relieved by operation, is reported by Roux⁹¹. The condition was due to rupture of the aponeurosis on the inner side of the joint in a muscular girl thirteen years old, and the disability consisted in a liability to fall whenever the quadriceps was vigorously or rapidly contracted while walking. Roux made two incisions, one on the upper and outer side of the patella, through which the vastus externus was completely divided; the other on the inner side and prolonged beside the ligamentum patellæ to the tuberosity of the tibia, through which the rent in the aponeurotic expansion was closed with buried catgut sutures, and the ligamentum patellæ was detached from the tibia, moved about half an inch to the inner side, and fastened again to the tibia by means of two nails driven through the skin. Full antiseptic precautions; uneventful course; cure of the disability.

In a case of irreducible outward dislocation of the patella in a man twenty-eight years old, Lucas-Championnière³ cut a groove

on the inner condyle of the femur, moved the patella into it, and fixed it there by means of a dozen buried sutures. The wound healed in twelve days, and at the time of the report the patient was regaining mobility in the joint.

Dislocation of the Upper End of the Fibula.—Two cases of this rare dislocation, in both of which the displacement was forward, have been reported, one by Hirschberg,²²⁸ the other by Leggatt.⁶ In both cases the reduction was easily made. Hirschberg accompanies his report with a detailed study of several recorded cases and the results of experimentation.

Among the text-books published during the year upon the subjects treated in this department may be mentioned those of Hoffa,¹⁰⁹⁷ Stetter,¹⁰⁹⁸ and Stimson.¹⁰⁹⁹

GUNSHOT-WOUNDS, SNAKE-BITES, ETC.

By D. HAYES AGNEW, M.D., LL.D.,

PHILADELPHIA.

ALTHOUGH a large number of articles were furnished this department during the year 1888, but little was found in them that could be considered as progressive or presenting new features.

GUNSHOT-WOUNDS.

The treatment of penetrating shot-wounds of the cranium has been very clearly defined by Bryant.¹ The indications, as presented by this writer, are: (1) the arrest of hæmorrhage; (2) elevation of depressed fragments of bone; (3) removal of foreign bodies; (4) the establishment of good drainage; (5) the combating of inflammation. The means for arresting the hæmorrhage must be determined by the source of the bleeding. If from the vessels of the scalp, the means proper to bleeding in general will be necessary, viz.: ligature or pressure. If from an opening in the bone, a plug of catgut will accomplish the end. If from the vessels of the pia mater, pressure with an antiseptic pad or compress will arrest the flow. When the vessels of the dura mater bleed, they should be ligated with catgut. The middle meningeal artery when wounded may evade the ligature by its position in the groove or canal of the bone. Under these circumstances a portion of bone may be cut away in order to expose the vessel, when it can be tied. Plugging with catgut in cases of bleeding from the meningeal artery, the writer thinks, is not a safe procedure. Should the usual method fail, the Langenbeck clamp may be employed, or any clamp which will press the vessel against the inner table of the skull. Hæmorrhage from a sinus should be controlled either by a compress or by suturing together the sides of the wound; and bleeding from the brain substance by introducing along the track of the ball an aseptic pad with a thread attached.

Foreign bodies should always be removed from the brain when they can possibly be located. The aluminium probe is con-

sidered the best instrument for locating balls, etc. When a missile can be located much nearer to the point of the skull opposite to the place of entrance, it is better to make a counter-opening for its extraction than to drag it along a long tract in the opposite direction. Drainage by horsehair or catgut threads is as important in intracranial as in other wounds. In support of extraction the table of Wharton is quoted, and also an analysis of one hundred and forty-five cases collated by Arnold. In the three hundred and sixteen cases of foreign bodies in the brain analyzed by Dr. Wharton, two hundred and thirty-six were balls, buckshot, or fragments of balls. Of this number the missiles were removed from the brain in sixty-six instances, while in one hundred and seventy cases the foreign bodies were allowed to remain. Of the sixty-six patients in whom the removal of the missiles was effected, twenty-seven, or 40 per cent., died, and thirty-nine, or 50 per cent., recovered. Of the one hundred and seventy missiles not removed, ninety-seven of the patients, or 57 per cent., died, and seventy-three, or 43 per cent., recovered, making 17 per cent. in favor of extraction. The analysis of Arnold's cases—one hundred and forty in number—yielded a result corresponding to that furnished by the collection of Wharton; that is, in eighty-five cases in which the missile was removed or passed out primarily, forty-seven, or 55.3 per cent., recovered; while in fifty-five instances in which no removal was accomplished, only twenty-three, or 41.8 per cent., recovered. The mortality following balls which passed through and through the skull was somewhat greater than that following instrumental extraction.

Military surgeons at the present time are coming to the opinion that, excluding the head, the extraction of balls is a matter of secondary importance, and do not favor any prolonged attempts toward accomplishing this object. These wounds, when made by a ball alone, are for the most part aseptic, and, if left alone and dressed antiseptically, heal without sloughing to any extent. Often balls can be removed with better results if allowed to remain until the track of the missile has healed.

In regard to laparotomy for gunshot-wounds, a much bolder and more successful surgery has been practiced than was formerly the custom. H. C. Dalton, of St. Louis,⁹⁶_{v. 8, p. 61} has collected and analyzed sixty-nine cases of shot-wounds of the abdomen treated

by laparotomy, with twenty-seven recoveries and forty-one deaths. This result is in striking contrast with the old or expectant plan of management, by which the mortality amounted to 92 per cent., or less than 8 per cent. recovering. Dr. Dalton, in a shot-wound of the liver, sutured with success the opening. The same patient had a perforating shot-wound of the stomach, both of which were closed by Lembert sutures, the patient making a rapid recovery.

J. S. McArdle states that up to 1887 not more than forty cases of intestinal suture for perforating wounds are on record, thirty-four of which may be accepted as authentic. Eight of these occurred in 1885, with four recoveries; fourteen in 1886, with three recoveries, and seven in 1887, with one recovery.

Various clamps and elastic cords have been suggested and used to control the contents of the intestine in cases demanding resection, but both MacCormac and McArdle agree in saying that the fingers of an efficient assistant are better for this purpose than any instrumental appliance. (See Section B, this volume.)

SNAKE-BITES.

Soldiers located on the outposts of civilization are often the subjects of snake-bites.

J. C. Roberts, of Pulaski, Tennessee,⁸⁶ reports the case of a young man who was bitten by a copper-head (*Trigonocephalus contortrix*). The wound was inflicted on the little finger. The patient was not seen for three hours after the receipt of the injury, at which time the hand was much swollen by exudation and by the extravasation of blood. The breathing was difficult; great pain and intense agony were experienced over the præcordial region. The young man had taken about half a pint of whisky before starting for the doctor's office. This agent was repeated in tumblorful doses every ten minutes until an additional half pint had been taken. In addition to the whisky, one drachm (four grammes) of ether was used hypodermically, and also a 5 per cent. solution of permanganate of potash in the vicinity of the wound, after which improvement commenced and by the following day the patient was quite well.

H. C. Yarrow, a well-known army surgeon,¹¹⁷⁴ has contributed a number of articles upon the poisonous reptiles of America. His experiments were made with a view to ascertain the value of per-

manganate of potash as a remedy against the venom of the rattlesnake. In cases where the circulation of the part could be immediately arrested by a cord, the drug, when introduced in and around the bite, proved effectual, but not otherwise, although injected within five minutes after the infliction of the wound. Experiments were also made with jaborandi, or pilocarpine, which seemed to prove that the remedy possessed certain antidotal properties.

Feoktistoff, St. Petersburg, Russia,¹⁴_{Oct.} gives the results of his experiments on snake-venom, which do not materially differ from those already given.

The mortality from snake-bites in India for the year 1886 was very great, twenty-two thousand two hundred and thirty-four human beings having perished from this cause, and two thousand five hundred and fourteen cattle. ⁶_{July 28}

Early, of Ridgeway, Pa.,¹⁴⁴_{Aug.} whose practice lies in the counties of Elk, Clinton, Cameron, and Clearfield, regions abounding in rattlesnakes, has treated successfully twenty-five cases of snake-bites by the free administration of olive-oil,—an old remedy.

S. I. Lee, of Springfield, Oregon,¹⁴⁰_{Sept.} speaks in commendatory terms of a decoction of the *Eryngium aquaticum*, or corn snake-root, taken internally and applied locally as a remedy for snake-bite.

Bousseau, of Luçon (Vendée),⁸⁰_{Nov. 15} reports a case of snake-bite cured by *cedron nut*. One nut, powdered and mixed with two ounces of white wine, was administered to the patient, a carpenter nineteen years of age, who had been bitten on the little finger by a viper. A mixture of the root with alcohol was applied to the wound, and, although the patient was extremely ill, he made a good recovery.

Henry Sewall, of Ann Arbor, Michigan,⁴⁶² performed a large number of prophylactic inoculations of snake-venom in pigeons, using a dose of the venom less than the fatal quantity, and found that the birds, after recovery, were measurably protected against the poison, as subsequent inoculations with quantities much above the fatal amount failed to destroy life. The protection lasted for about five months.

TUMORS.

By MORRIS LONGSTRETH, M.D.,

PHILADELPHIA.

DURING the past year some additional work has been done on the general etiology of tumors, especially in relation to their bacteriological origin, but no further positive observations are to be noted. A discussion has arisen concerning the priority of the discovery of the bacillus of carcinoma; it has been shown¹⁷_{Dec. 10, '87} ¹⁶⁴_{Jan. 8} that Rappin was the first to announce this discovery,¹²⁷₁₈₈₆ and subsequently communicated it to the Académie de Médecine, of Paris, in January, 1888. Even Domingo S. Freire's experiments¹²¹⁵₁₈₈₇ precede those of the Berlin work.

Further observations and experiments have been made for this bacillus, E. Senger,⁴_{Nov. 8} claiming the infectious nature of cancer, which for him means an external and bacillary origin, and even advancing new grounds for this opinion. These grounds are the similarity to inflammatory and pyæmic diseases and their metastases, and, second, the occurrence of those rare cases of general miliary carcinoma, so much like miliary tuberculosis. These reasons, which do not appear wholly satisfactory to Senger even for infectiousness, by no means preclude the idea of auto-infection or local perversion of cell growth. He asserts that the cancer bacterium, if such exists, must possess powers different from all previously known bacteria, since so far bacteria have been described as causing homologous disturbances and processes but never heteroplastic growths. Senger has worked at the development of tumors by inoculation of fragments of cancer and at the cultivation of the bacterium. He failed to produce in animals—mice, rabbits, and dogs—carcinoma artificially by implantation, and, while he does not claim that his experiments exhaust this branch of the question, he does think that bacilli, if present, ought to have grown and become conspicuous under the favorable situation for their development, even if not equal, under all of the circumstances, to producing a tumor. His

bacteriological investigations with numerous culture media failed to produce a bacterium from a cancer which stands in an etiological relation with the growth. Scheurlen's bacillus he has never been able to produce except when the cultures were made on a potato, although other bacteria have made their appearance, as he thinks, by contamination. He points to the strange fact that Scheurlen's bacillus grows when first taken from the tumor only on potato but afterward on every media, and Senger states that he regards it as a potato bacillus, and that, in fact, he has been able to produce it from a potato sterilized in the usual manner.

Pfeiffer, of Wiesbaden,⁶⁹ has examined carcinomatous tissue and reports that his cultures were without result. The media either remained sterile or showed well-known forms of bacteria, never showing any of Scheurlen's bacilli. Pure cultures of Scheurlen's resembled those described by Hauser as *Proteus mirabilis*. He thinks Senger is in error in regarding it as the potato bacillus. In either case this bacillus is not the cause of carcinoma, since in either form it is not pathogenic. Baumgarten and Rosenthal, of Königsberg,⁵⁰ report that they found on the sterilized potato before the application of the cancer-juice a bacillus strikingly similar, if not identical, with that of Scheurlen's. By Scheurlen's method of staining they found this bacillus in the greater number of carcinomatous specimens examined, mostly from the mamma but also from other localities; they found it in a variety of sarcomas and also not rarely from the surface of the normal skin and mucous membrane. Their opinion is distinctly opposed to the specificity of Scheurlen's bacillus. Carl Franke, of Munich,⁸⁴ assistant at the clinic, has been examining Scheurlen's bacillus and reports his results to the Society of Morphology and Physiology of Munich. His work was carried on in the same manner as Scheurlen's, and the results in carcinoma were essentially the same. The examination of his three specimens of sarcomas showed him an entirely similar organism (Pilz) as the one from the carcinomatous tissue, only that the bacillus was thinner and longer. In the discussion the pathogenic character and causal connection of this bacillus with malignant tumors was spoken of with much doubt by Bollinger, Buchner, Emmerich, Escherich, and others. Makara,⁶⁰ from the material from the clinic of Professor Kovacs in Buda-Pesth, reports that the examination of a large

number of morbid growths, fourteen carcinomata and four sarcomata, remained practically without result. In the examination of fluid from the tumors he saw the spores which Scheurlen described, but regards them as fat-drops and molecular matter and proved them to be such by the application of reagents. He is evidently of the opinion that the facts which have been relied upon to indicate the infectious nature of morbid growths and their bacteriological origin are open to a better explanation through the well-established facts of cell genesis and growth. Rosenthal, of Königsberg, whose work with Baumgarten has already been referred to, gives a full account of it later.^{58 Oct. 17} He reports finding micro-organisms in the normal mamma, both on the surface and in the depth of the tissue; that Scheurlen's bacillus is not found exclusively in carcinoma but rather more frequently in other new formations; that it does not always occur in cancer and that other organisms are present; that Senger's conclusion is unnecessary which attributes this bacillus to the potato or to uncleanness, since the organism is already present in the depth of the morbid growth. So wide-spread is its natural distribution, that this saprophyte occurs on the normal skin, and that Bizzozzero and Bordoni-Uffreduzzi have already described it as a leptothrix under the name of bacillus epidermis, that their identity is rendered the more probable since Rosenthal found Scheurlen's bacillus only in new formations lying near the skin from which it penetrated, and not in cancers of the liver, stomach, diaphragm, and rectum. He concludes that Scheurlen's bacillus is not of pathogenic nature and cannot be the cause of cancer, on account of its inconstant occurrence, of its occurrence in other tumors, of its presence (or an organism entirely similar) on the normal skin, of the striking fact that in the cancerous tissue the bacilli are not or only rarely present while the spores are constant, and, finally, on account of the negative result of Senger's inoculation of animals and the doubtful results of Scheurlen's. Lampiasi,^{589 Nov. 4; 590 Mar. 1} reports successful cultures on various media with nearly all specimens of malignant new growths and failures with benign tumors. Inoculation of animals with the blood of an encephaloid patient was without result, and Lampiasi failed to show the bacilli by any staining method, especially in the sections. An inoculation, which, as above mentioned, when made directly from the encephaloid patient, succeeded from a bacillus

culture from the same blood in producing after fifty days a nodule in the normal skin of the same patient which, after excision and microscopic examination, showed an alveolar stroma with wide meshes, which contained many epithelial cells of different form and size. From the results of his experiments Lampiasi's inferences and conclusions seem uncommonly positive and strong.

Ballance and Shattock²,₁₉ report that the tubes inoculated with cancerous material a year ago still remain sterile. Their communication dealt with the histological changes which take place in normal and morbid tissues during incubation. The normal tissues behave very differently from the cancerous; in the latter the epitheloid cells after eight days' sterile incubation showed their nuclei "very granular; the nuclear matrix was either slightly stained or colorless. In some of the nuclei there was a distinct net-work (nucleoplasm). There were also large, distinct granules or nucleoli; the nuclei had a delicate continuous outline, even when the projections of the contained granules gave them a spinous form." Sometimes the granules lay free in the cell-protoplasm, though still connected with the nucleus by thread-like processes. The granules were also found in the connective-tissue corpuscles as well as in the fibrous connective tissue distributed thickly and uniformly; they varied in size, were round, oval, or comma-shaped, and occurred alike in carcinomata and sarcomata. It is not positively stated that incubation is necessary for the production of this condition, as somewhat similar granules might be seen in fresh tissue of carcinoma. "The appearances presented by the element of normal tissue, either before or after incubation, were entirely distinct." "In the testicle only did a process occur at all comparable to that observed in cancers; the liberation of the spermatozoa was normally accomplished by a disintegration of the nuclei. Although no explanation could, as yet, be afforded of the import of the peculiar appearances observed in cancer, it seemed probable that they had an intimate bearing on the local and general infective processes. It was thought by no means improbable that these detached buds (granules) might by their dissemination be one means of conveying infection to the lymphatic glands, and, like the spermatozoa, be the *semen* by which the growth was called forth in other parts of the body." They suggest an analogy to certain changes in protozoa, and "if this were so they

might be called *cancerozoa*." Gussenbauer, in 1880, stated that the secondary infection of lymphatic glands was effected by small granules, presumably derived from the primary tumor, which entered the cells of the glands, and incited them to multiply or to take on the characters of the primary growth.

It seems to me that these observations of Ballance and Shattock contain the elements of truths of far wider signification than any thus far attained in the science of biology, and especially of pathological biology; that they are much more than minute points and curiosities which can be seen only with a Zeiss' one-twelfth homogeneous immersion and a three or five eye-piece, and that, properly followed up, may mark a new era on a new basis in the study of disease. A large part of the facts furnished by these men are not new (and, perhaps, therefore, more likely to be true), but the way of looking at the familiar thing is quite novel. It is very much more like the psychology of cell-life than it is the physics of biology. The granules here described are familiar enough, and it is from their absence or presence that oftentimes we are able to say a cell shows normal or morbid conditions; their amount may even furnish the clue to the degree of cell activity under normal conditions; their complete absence is a pretty sure sign of functional changes. The performances of these granules, after the death or ablation of the cancerous tumor, is here for the first time looked into, and it is a subject which requires very much more profound study. It is easy of credence, on *à priori* grounds, that the granules are potent and, under morbid conditions, possessed of virulent qualities, since they are derived from the nucleus of the cell, and even after death maintain, for a time, connection with it. The nucleus is the important part of cell growth and multiplication in the normal state. Why may we not believe and why is it not consistent with our usual notions of histology that a nuclear fragment of a morbid cell of a new formation can detach itself from the parent cell, wander off and start an independent life in the immediately adjacent tissue or even a remote lymph-gland or another organ? These experiments are, in truth, "cultures," not of micro-organisms, but of the cells themselves, by which, indeed, not a "crop" and succeeding generations of cancer-granules are produced, but merely a means of exemplifying the capacity of the cancer-cells in a direction of their activity, which during their life

or otherwise we have no opportunity of viewing. If this superlative energy can be shown to exist in the cells of a morbid growth or with any morbid characteristics, the majority would be far more ready to believe that the power of "infectivity" or of reproducing new cells resided in these potent "nuclear granules" than in a micro-organism of undoubted authenticity. These observations do not contribute any explanation to the cause of the perverted growth of the first or foundation cell of the tumor. But if "infectivity" is shown to be due to cell action, and not to a micro-organism, we have less difficulty—in fact, there is no difficulty—in believing that the cause of the tumor and its propagation and dissemination are the same for each process.

The most important and far-reaching paper of the year is the communication of Virchow,²⁰ Bd. 111, H. 1; Jan. 21 on the diagnosis and prognosis of carcinoma. The article reads like a new chapter from the author's "Die Krankhaften Geschwülste" of 1863, or an addendum to his earlier paper, "Zur Entwicklungsgeschichte des Krebses."²⁰ Bd. 1, 1847 It is not possible in an abstract to give its value and make its deep worth apparent, for there is nothing superfluous, nothing which is not essential, and it is at most but possible to give a catalogue of the chief points. In the first place, historically, Virchow shows that the diagnosis of cancer was not established on a sure basis until its anatomical structure was correctly shown, and it is to himself we owe this knowledge. As Virchow found the matter at the beginning of his labors, the clinical features formed the basis for the diagnosis, and Johannes Müller, although he had pointed to many of the distinctive features of "cancers," contended that "in general all tumors were cancerous which, retaining the natural structure of all the tissues, are either at first constitutional or become so in the natural course of their development or on the recurrence after extirpation, and finally lead to the death of the individual." Virchow's test was that a carcinoma must consist of "an alveolar formation composed of a connective frame-work and cellular contents." Later he indicated certain differences of structure in these growths which determined their clinical aspects, and thus could be constructed an approximate "scale of malignity." From this results a certain degree of relation between the diagnosis and the prognosis. Further, "the cancer-formation begins with the development of epithelial cells in a position where they do not

properly belong, and the recognition of the impropriety of the place (heterotopie) is the first step in the diagnosis."

The absolute necessity of selecting for diagnostic examination a portion of the tumor from the depth of it, not merely its periphery or a surface-scraping, is insisted on. The reason of this demand is self-apparent, since it is manifest that on the surface, especially if the growth is on an epithelial-clad surface, we shall not find the characteristic alveolar arrangement of the connective-tissue frame-work and the misshapen, misleading, but preformed epithelial cells belonging to the normal surface will appear in abundance in any superficial fragment. What pathologist, last summer, hearing Virchow's report on the examination, did not feel sure of the one of two conclusions, viz.: either that the growth in the Crown Prince's larynx was not an epithelioma, or that the portion sent to Virchow for examination was not characteristic of the growth (because not taken from the depth of the formation—and very probably the latter, since his wording of the report was so careful and guarded)? Which one of us, on being asked if a small fragment removed by the forceps from the uterine cervix is carcinoma or not, has not made answer (or ought to have done so) in like language with Virchow, that "the specimen does not show an arrangement of its tissue which is characteristic of a carcinoma or epithelioma, or of any morbid growth?" This is the only proper form of answer. If the fragment is not taken from a sufficient depth to show the alveolar frame-work with its cell-contents,—to show, in other words, a growth of epitheloid cells out of their proper place of growth,—the answer must be indefinite or well-guarded. Whether the specimen is or is not a fair representative of the growth is to be determined by the clinician, and not by the pathologist, and with the former the responsibility must rest. The fragment from the Crown Prince's throat was not a representative one, and probably no one knew the fact better than Virchow (not to defend himself, for no one is less in need of defense), but to teach a lesson so constantly requiring to be enforced. Virchow insists that from the mere clinical facts the character of the growth cannot be known or the diagnosis determined. He quotes with approval Leucke,⁴⁰⁴_{No. 97, 76} who says that, in spite of the obvious advantages of the clinician for intimate observation, the clinical diagnosis of tumors ought not to be relied upon too exclusively, nor

the attempt be made, as has been done mistakenly from time to time, at a classification according to purely clinical features. "A correct clinical classification must always coincide with the anatomical, since, after all, clinical knowledge depends on anatomy and physiology jointly." Virchow adds that, while this is true, it is even more true that the clinical features themselves give no basis for classification, that a knowledge of the anatomical structure is essential not that the anatomist alone can make the diagnosis, and not that an examination must be made before every diagnosis, but that a knowledge is essential to correct diagnosis and prognosis.

Virchow alludes next to the development of the views concerning "an especial or a specific cell." At the Académie de Médecine, in 1855, Velpeau headed the discussion against the "Micrographists," and Virchow came to his aid, and with this discussion practically ended the question of specific cells for cancer. The account of the recognition of tumors of a mixed type is most interesting. Carl Friedländer's discussion of the origin of the cells in cancerous tumors Virchow points out to be not a practical question in their diagnosis; at the most it could only lead to confusion in the granulation tissue about a fistula. In regard to a specific bacillus, Virchow does not speak with great enthusiasm, and adds: "but the need of such an organism is not imperative, for animal cells have just as much power as bacteria in metabolism, and there is no reason for withholding from a cancer-cell properties allied to those possessed by gland-cells."

Of the nature of carcinoma, Virchow holds firmly to the view he long since expressed, that the disease is primarily local and the dyscrasia a secondary result. Hence, in the treatment he strongly advocates an early and thorough operation. He says: "The difficulty to a complete cure lies in the continued formation of accessory foci. In itself the carcinoma is not a growth of great duration. Its cells have a marked tendency to degeneration. Could this metamorphosis be extended over all parts of the growth and hinder the formation of the accessory and metastatic nodules, a definite healing would be certain . . . the possibility of the spontaneous healing of cancer should not be excluded." He advocates strongly the use of drugs, and alludes especially to the chian turpentine used by John Clay, of London. "It seems that regarding these therapeutic experiments the medical world is too

skeptical. Whatever means can be found which will lead to the degeneration of the cells must be the first step in the cicatrization and healing of the new growth. "If cancer is in its beginning and often for a long time a local disease, then it must be possible also in this time to heal it locally."

Alex. Pilliet⁹¹_{Feb. 10} gives a very complete historical account of all the work of experimenters in the reproduction of malignant growths by means of inoculations. James Braithwaite has during the year contributed two important papers on the question of cancer and its malignancy. In the first, "What is Cancer?"⁶_{June 30} he takes up the two questions: 1. Why is proliferation of epithelial cells malignant when proliferation of other cells is not so? 2. What is the cause of this proliferation? His answer to the first is that he believes "that the natural properties of epithelial cells—properties or peculiarities which fit them for their functions when growing in their proper place—are such that, when growing out of their place of proliferating, encapsulation is impossible. The resulting growth is therefore necessarily malignant because non-encapsulation of a growth means infiltration by a growth. In other words, an epithelial cell growing without a basement membrane is malignant or more destructive and more exhaustive of vitality than is a cell of the same character growing *in place*, that is, it takes more force to grow an epithelial cell without its proper basement membrane than with one. This view would help to explain some of the difference in the kind, degree, or quality of malignancy in cancer and sarcoma, the latter being lower in the scale of malignancy because it is a growth of cells *in place*, and because the cells are not epithelioid. This is the view which I advocated in my former article and in my editorial comments in the American edition of Holmes' surgery, and Braithwaite seems to be the first that has fallen into a similar train of thought. Braithwaite considers, as a by-question to the first one, "How does the epithelial get at first beneath its basement membrane?" He speaks of two factors, diminished resistance of the basement membrane and an increased pressure of the epithelium upon it, and gives a list of six conditions which may be regarded as the cause of the one or the other of these factors. He does not advert, however, to the idea which I suggested last year, namely, that there existed in the blood-current corpuscular elements potentially epithelial, and which,

normally passing through the basement membrane, went to the regeneration and growth of glandular or surface epithelium. No one ever saw (or has reported on it) an epithelial cell in the normal or even in the morbid growth passing from the surface backward through the basement membrane into the subepithelial connective tissue, whereas the passage of corpuscular elements outward through the basement membrane, and their growth and permanency on the epithelial surface, can be observed and has been recorded. If one is making a theory about a deeply obscure and mysterious process of growth, it is just as well to make the theory an easy working one, and one somewhat closely in correspondence with previously observed facts.

In answer to the second question, What is the cause of this proliferation? he points out that nearly all investigators have devoted their attention to it, "neglecting altogether the part of the subject with which we have been dealing. It appears probable that proliferation may rise, or can only rise, in two ways: from the removal of a force, which may be called the force of formative restraint, or, from the addition of a force unknown." It is true, as Braithwaite says, that most investigators have devoted their attention to the question of proliferation—which in truth seems so easy of explanation, for, indeed, how can we fail to think that the epithelial cell once out of place in the succulent juice of the connective tissue should fail to proliferate—and yet they have all failed to hit upon a ready explanation of how the cell got *out of place*. The forces which Braithwaite cites seem valuable and efficient ones in deterring or misguiding the corpuscular element in following its usual course and becoming a normal epithelial cell. Why these forces do or can pervert cell growth is to explain the method of action of the *causes* of disease, and the explanation is just as easy, or rather as difficult and impossible, as it is to say how the sperm acts on the ovum to cause certain fragments of the segmenting mass to form liver-cells, others surface epithelium, and still others muscular fibres.

In a second article Braithwaite considers "What is the Cause of Cancerous Infectivity?"⁶_{Aug. 18} and points out that it is necessary for the understanding of this question to realize that vitality is comparative. Comparative vitality is to be seen in the component cells of the tissues of the body, and variations in this vitality occur

as the result of external circumstances. Any condition which increases the degree or intensity of life of the epithelial cells invading the connective tissue furnishes a cause for the permanency of their growth in that situation, and when these cells are carried to the neighboring lymphatic gland their vitality overpowers that of the gland-cells, and the invaders win the day in this situation also. Such, in brief, is his elucidation of the question of infectivity.

Maurice H. Richardson, of Boston, ⁹⁹_{Aug. 20} in a very valuable contribution, "Observations on the Surgical Treatment of Malignant Growths," gives a collection of "all cases of malignant disease treated in the Massachusetts General Hospital by excision from November, 1877, to November, 1887." His conclusion is that "we are to operate upon cases much earlier discovered and recognized, and more carefully studied, with very much better results. The average operation will be more radical, more thorough, more formidable, and more truly conservative, because it will only be performed when its most radical performance promises the greatest good, namely, at the beginning of the disease, and not when the near approach of dissolution has made it, as too often in the past, the most forlorn of forlorn hopes."

S. W. Gross ⁵_{Apr.} gives "A Clinical Study of Carcinoma of the Breast and its Treatment." The present paper deals first with the prognosis and diagnosis, and finally with the methods and results of his operations. His preceding paper ⁵_{Nov.} included the consideration of the general pathological physiology of mammary carcinoma and an examination into the frequency of metastatic deposits.

R. M. Hodges ⁹⁹_{Nov. 29} contributes a paper on "Excision of the Breast for Cancer." His article is in part supplementary to his address before the Massachusetts Medical Society, and in part a reply to Richardson's paper, to which we have already alluded. His plea is strongly adverse to the habit, as it may be called, which has lately come into vogue, of the indiscriminate amputations of the breast. He questions very shrewdly whether statistics are really of value in the scrutiny of a disease like cancer, and points out many of the defects which these statistics must possess. He shows the real danger which exists, even as shown by the most favorable statistics, in the destruction of life which might otherwise have lasted for years; but the weightier reason for his protestation is

the inadequate character of the operation, since the histological examination shows that not merely the axillary glands but the surrounding tissue is in the larger number of cases infiltrated.

Arthur Jackson, of the Sheffield Infirmary,²²_{May 20} and MacNamara, of the Westminster Hospital, London,²_{May 19} both raised their voices, in clinical lectures, in opposition to the growing prevalence in favor of universal operation for mammary carcinoma.

The Société de Chirurgie (Paris) discussed at two meetings⁷³_{Mar. 3}, ⁹¹_{Apr. 10} cystic disease of the breast, or what has been spoken of lately as *maladie de Reclus ou maladie kystique de la mamelle*. Among those joining in the discussion there seemed to be no difference of opinion as to the real existence of this disease, and the histological examinations seem to be in accord, but the interpretations of the lesions vary markedly. Almost all the acini are occupied by the cystic dilatations, while the interstitial or periacinous tissue remains normal. Brissaud and Malassez show that the cysts have a complete epithelial lining, comparing it to what is observed in the ovarian cysts and occasionally in the testicle, and incline to the opinion that the disease is malignant. The maxillary glands are not shown to be enlarged. Quénu speaks of it as *cirrhose épithéliale kystique du sein*. Tillaux and Phocas speak of it under the name of *maladie noueuse de la mamelle*; Verneuil spoke of *kystes racémeux*, and Reclus points out the differential diagnosis as presenting certain differences from cysts of fibroadenoma. This affection is more frequently multiple and bilateral; in the fibroma, although the cysts may be emptied by puncture, a tumor still remains, while in this malady, if successful, it causes a total disappearance.

A. H. Ferguson, of Winnipeg, Manitoba, collaborator, reports on the use of galvanic electricity in the treatment of cancerous tumors of the breast. A patient twice operated on for scirrhus of the mammary gland has been, during four years, rendered fairly comfortable in respect to pain. The growth has been retarded in its progress and the general health and possibilities for activity greatly improved. The treatment consists of the daily application of the current derived from two large ammonia muriate cells, such as used by the telephones. The current is allowed to pass for as long a period as the convenience of the patient admits. It would seem advisable that such treatment should be more extensively used

and the results observed. What might not a continuous current effect during its six months' flow without intermission?

Robert Dreyfuss²⁰_{pp. 536, 538} contributes a valuable paper on the "Pathological Anatomy of the Mammary Glands." His work includes the histology of multiple cysts, of cystosarcoma, of hyaline degeneration of the walls of the ducts and acini, and of true adenoma. A complete bibliography is also given.

Holger Mygind, corresponding editor, of Copenhagen, reports a case of multiple cysts of the mammary gland (*maladie de Reclus*) by Rovsing.³⁷³_{May 2} There were multiple cysts in both mammary glands, and the left mamma and axillary glands were removed. The removed mamma was found beset with numerous small cysts and a few large ones, all filled with a thin, yellow fluid. The walls of the larger cysts appeared to consist of simple fibrous tissue, while the lining of the smaller ones was covered with flat epithelial cells. The axillary glands showed simple hypertrophy. The diagnosis had been made of malignant disease.

At the last meeting of the French Congress of Surgeons (March 12th-17th) the most important question was the recurrence of malignant growths after extirpation. Casin⁹¹_{Apr. 11} gave his results from 1862 to 1886, which are to be regarded as the most favorable thus far shown. He attributes his success to the thoroughness of the operation, paying no regard to the immediate reunion of the wound, thoroughly clearing out the axilla and destroying the lymphatic trunks. Verneuil spoke of the increase of cancerous disease and its recurrence after operation, which he suggested might be due to the increase of carnivorous food in modern diet. He spoke also of the use of arsenic and alkaline waters in the subsequent treatment, and protested strongly against the use of iodide of potash.

In the Seventeenth Congress of the German Society of Surgery, König, of Göttingen,⁴¹_{Apr. 9} spoke concerning the prognosis of carcinoma, and claimed that the operative healing of this malady had advanced to a new stage, and that the antiseptic method had robbed it of its chief dangers. He divides his cases into two classes,—those in which operation is undertaken for temporary relief, and those where there is expectation of a definitive healing of the disease.

Haeckel, of Jena,³³⁶_{No. 17} reports on the subject of fatty tumors of

the sheath of the tendons, and Kurz³³⁶_{No. 27} also writes on the same subject. The great rarity of the condition renders it interesting. The symptoms are those of gradual swelling, pain, increasing mobility; crepitation was distinctly present. The condition was mistaken for hygroma, the conditions being very similar, but puncture renders the matter clear. Sprengel³³⁶_{No. 3} also contributes a paper on this subject.

A. Broca,⁷ describes subperitoneal fatty tumors of the inguinal canal, and speaks of their frequency of occurrence and of the difficulties of diagnosis in respect to hernia.

Schmidt, of Aschaffenburg, Bavaria,³⁴_{No. 16} reports on the use of the parenchymatous injection of ozone-water. He employs it in the strength of fifty milligrammes (one-twelfth grain) to the litre (two pints) of water, the number of injections varying, with the cancerous area, from one to forty daily, being made of different depths into the diseased and healthy structures. He thinks that the ozone destroys the cancerous masses without attacking the normal structures of the body at large. No ill results were observed. The cancerous sores cleared up perceptibly and cicatrized. The nodules became smaller, though frequently showing reacting changes. The microscopic examination showed a disappearance of the nested or alveolated cells.

W. A. Mackay, collaborator, from Heulva, Spain, reports two of those rare cases of congenital coccygeal tumor, treated by excision. The patients were both female infants, aged respectively three months and two and a half months. The microscopic examination was made by Bruce, of Edinburgh. Mackay expresses the opinion that the results of the examination confirm the views of Bland Sutton, who regards these growths as cystic development of a persistent post-anal gut. The most valuable paper on the subject of these tumors is one by Hodges, of Boston, published some years ago. During the last year I met with one of these congenital cysts in a young woman aged about twenty-three. It had been in a state of suppuration during many years, and the disease was considered by her friends to have been caused by a fall on the ice a few years previous. Several fistulous openings existed, which discharged fatty pus, thought to be due to disease of the bone. In the interior of the cavity was found a large bundle of hair, which is sometimes present in these congenital cysts; this

shows that the cysts are not alone derived, as Sutton suggests, from the mucous membrane, but are, as Hodges shows, involutions of the dermal layer.

Ramon de la Sota, corresponding editor, Seville, Spain, sends an interesting account of angioma of the forehead in a little girl, aged two years, treated successfully by electrolysis under the care of Menocal.⁴⁵⁶ Aug. 20 The tumor was the size of a large filbert, smooth and soft, of violet color, and could be reduced by steady pressure. Elastic compression had been tried without result. The electrical current was applied by introducing the needles at various parts with points toward the centre of the mass. The three-minute applications were repeated every third day. Slight eschars at the negative pole and later a little suppuration, but no hæmorrhage, resulted. No trace of the tumor remained.

Jules Félix¹²¹⁶ gives the results with the use of caustics in twenty-five cases of malignant disease. The principal agent in his caustic is chloride of zinc, which is combined with corrosive sublimate, iodol, and bromide of camphor.

W. Roger Williams⁶, Apr. 14, writes on "The Classification of Neoplasms." He follows the histological classification of His, who distinguishes only two general layers, the archiblast and the parablast. He regards the former as originating from the cells of the ovum and developing all the products usually ascribed to the epiblast and hypoblast, while the parablast, originating from the white yolk, develops the connective-tissue series with the blood-vessels. His classification, then, may be briefly stated as follows:—

- | | | | |
|----------------------------|---|---|--|
| I. Archiblastic neoplasms. | { | 1. Lowly organized—
Epithelioma, | { Squamous,
Cylindrical,
Glandular. |
| | | 2. Highly organized—
Papilloma,
Adenoma,
Cystoma (neoplastic). | |
| II. Parablastic neoplasms, | { | 1. Lowly organized—
Sarcoma,
Myxoma, | { Round-celled,
Spindle-celled,
Myeloid. |
| | | 2. Highly organized—
Fibroma,
Lipoma,
Chondroma,
Osteoma. | |

An interesting case of hydatid cysts is reported by our corresponding editor, Dr. Pulido, of Madrid, Spain, as occurring in the practice of Mercant,⁷⁵⁶ also of Madrid. The patient, a woman sixty years of age, had had an abscess above the knee, which quickly yielded to antiseptic treatment. Five years after this abscess reappeared, and upon being opened was found to contain a large number of hydatid cysts. The treatment generally recommended proving useless, Mercant employed injections of ox-gall and lukewarm water, half of each, which caused the tumor and its contents to completely disappear in about a month.

ORTHOPÆDIC SURGERY.

By THOS. G. MORTON, M.D.,

AND

WILLIAM HUNT, M.D.,

PHILADELPHIA.

ETIOLOGY OF SPINAL AND ORTHOPÆDIC AFFECTIONS.

D. HAYES AGNEW, ⁹⁹_{Sept. 20} in his address as President of the American Surgical Association, indicated very clearly the relations of modern social life to some common forms of surgical disease. Owing to the requirements of education, children at school are kept under constant muscular restraint, more or less, which eventually leads to a host of physical imperfections; among these he mentioned weak ankles, narrow or contracted chests, round shoulders, projecting scapulæ, lateral curvature of the spine, etc.

POTT'S DISEASE.

In looking over the abstracts from the various journals of the past year, I find no new views as to the anatomy or pathology of this disease to report. Interesting and peculiar cases are found, and the mechanical contrivances for support and treatment are numerous.

W. O. Roberts, of Louisville, Ky., ²²⁴_{July 7} reports a case, believed to be one of incipient Pott's disease, with localized meningo-myelitis. The peculiarity was the presence in the urine of abundant crystals of sulphate of calcium in large numbers, with a few crystals of calcium oxalate. Dr. Cowell, who saw this case, says the condition is very rare, this one being the fourth he can find on record. Peyer had a case of the kind in a patient who suffered with myelitis dependent on kyphosis. The patient of Roberts was a farmer, aged twenty-two, who had strained himself severely while "sawing a haystack."

A curious case is reported by Henry Hun, of Albany, ⁹_{July 28} of a man, aged thirty-four, a cooper, who had symptoms resembling those of locomotor ataxia in the arms, and in the legs those of spinal spasmodic paralysis.

The case is spoken of as bearing some resemblance to one reported by S. Weir Mitchell⁹ as "locomotor ataxia confined to the arms." The spinous processes of the second, third, and fourth dorsal vertebræ were decidedly prominent and that of the fourth was tender. Dr. Morrow, having examined the spinal deformity, pronounced it an undoubted case of Pott's disease.

At the Liverpool Medical Institute, Alexander¹⁸⁷ exhibited a specimen of caries of the lower dorsal vertebræ, showing the ankylosis of the adjacent arches of several of the segments. There was a large destruction of the bodies of the corresponding vertebræ, which were included in an abscess filled with cheesy pus. The patient, a woman aged forty, had been going about for some years and was considered cured of the spinal disease. There was no paralysis. She died of cough and bronchial troubles. The right lung was honeycombed at the apex with clean cavities made up of cicatricial tissue. Both lungs were small, bronchitic, and lay compressed under the clavicles; the liver was amyloid.

Lejars⁷ reports a case of lumbar Pott's disease in a patient of eighteen years, who was admitted at La Pitié in May, 1887, during the service of Verneuil. In the right iliac fossa there was an enormous fluctuating tumor, which descended to the crural arch and was lost above, toward the spine. A small gibbosity was seen at the superior part of the lumbar region, and the spine was very sensitive at this point. The crest of the ilium was notched and ridged. The sac was twice aspirated, and seven hundred grammes of seropurulent fluid were taken at first. Iodoform and ether were injected, representing about two grammes (thirty grains) of the former drug. In October, incision was practiced by Verneuil in order to secure better drainage, and the injection was repeated. On the 10th of December there was a sudden and intense attack of dyspnœa. Double hydrothorax was present, œdema of face and extremities came on, suppression of urine became complete, and on the 24th the patient, without vomiting or convulsions, died of coma. The autopsy showed that the branching and enormous abscess had contracted very materially under the treatment. There was great disease and destruction of the third and fourth lumbar vertebræ. Adhesions to the cæcum and ascending vena cava were pronounced. There was no evidence of tubercle except in the vertebræ. The kidneys were enormous (great white kidney),

as also was the heart. The liver, weighing seventeen hundred and fifty grammes, was soft and fatty. The coma of which the patient died was due to uræmic poisoning.

An account is given ²⁴_{Jan. 8} of a recovery from Pott's disease by the use of iodoform-ether injections. The patient was a woman, aged twenty-nine years, who came under E. Ory's care. She complained of pain in the back and had been treated for rheumatism. She had no bad antecedent history. There was a fluctuating tumor on the left dorsal aspect near the first dorsal vertebra, which had commenced to project. The swelling descended about ten centimetres below the painful vertebra. At first rigid decubitus was ordered on a hard bed, and cod-liver oil and syrup of iodine were prescribed. Afterward about two hundred and fifty grammes of creamy pus were evacuated by the aspirator, and about fifteen grammes of a solution of five grammes (70 minims) of iodoform to one hundred grammes (twenty-five ounces) of ether were injected. Afterward points of the actual cautery were used, and within ten months several more injections of the above mixture were made after drawing off the pus. Recovery took place slowly, and the author thinks that it was due somewhat to injecting the liquid too far from the seat of the disease. When this method is used the effect of the injection is spent upon a secondary part of the abscess, whereas it is contact with the osseous origin of the disease that is needed to assure a cure.

Janeway, ¹⁹_{Jan. 28} in the Bellevue Hospital, New York, spoke of the almost universally masked early symptoms of Pott's disease, particularly in adults, and directed his class to look with suspicion on *persistent* lumbago. This is particularly important when there is any history of injury, such as strain or severe jar. He also quoted the case of a patient who was severely injured in the back by an accident while driving, which was due to the bad condition of the roadway. This patient lived for four years through great suffering. He sued the city for damages, and was a subject for rigid examination by experts on both sides. The nerve specialists denied the existence of spondylitis or Pott's disease, and described it as one of the various forms of sclerosis, and it was reported ¹_{Jan. 13, '88} as a case of "Allochiria." Afterward Dr. Janeway and Dr. Sayre pronounced it to be a case of Pott's disease, and so it proved to be. The patient was greatly relieved by the plaster-of-Paris jacket,

with the jury-mast. He finally, after going through various courts, gained a verdict of \$25,000. He died in May, 1885. An autopsy demonstrated very extensive destruction of the lumbar vertebræ and their cartilages. There was also ⁵⁹July 18, '85 almost general tuberculosis.

F. J. Paley,²_{Mar. 24} in commenting upon caries of the spine, speaks of the extreme difficulty of the diagnosis of early caries before curvature. He mentions the case of a woman, aged forty-one, which had been diagnosticated as hysterical, but she was found, a year afterward, to have caries, which resulted in fatal pressure on the cord. In distinguishing hysteria from organic lesion he says that he considers ankle-clonus, if well marked, always a sign of the latter, and that it is never produced by hysteria. In the debate which followed, Adolph Richardson referred to a case of hysteria in which ankle-clonus existed. Most of the debate was as to the difficulties of diagnosis, and as to choosing rest (decubitus) or jackets at once. Davy's hammock method of applying the plaster-of-Paris jacket was highly spoken of.

W. W. French,¹_{Feb. 11} before the Alumni Society of Bellevue Hospital, reported a child of six years who developed lumbar Pott's disease after a fall from a swing. The peculiarity was that upon auscultation over the projection there was a blowing murmur, more distinct upon the left side. The doctor asked if such murmurs were common in Pott's disease and referred to the diagnosis of pulsating tumors, as sarcoma, etc., in this location. R. H. Sayre said it was rare to find murmurs in ordinary Pott's disease, and he referred to the well-known erosions of the vertebræ in aortic aneurisms as causes of mistakes as to spinal disease. He regarded this case as one of unusual interest, and thought the murmur might be due to pressure on the vessel by the sharpness of the curve or by abscess.

Victor Bouchet,²²⁸_{Apr. 15} of Saint-Étienne, relates a case of retro-pharyngeal abscess having its source in a spondylitis involving the bodies of the fourth and fifth cervical vertebræ. This latter condition was only revealed by post-mortem examination, and in the account of the case the relator dwells upon the almost entire impossibility of making a correct diagnosis, as there were no symptoms suggestive of Pott's disease during the life of the patient. The case was an acute one, lasting from the 15th of December,

1887, to the 6th of February, 1888. The symptoms were pain over the thyroid, some swelling, facial erysipelas, dysphagia so that artificial feeding was resorted to, very little fever, temperature about 37° C. throughout, and no posterior deformity or pain. The case occurred in the service of Cénas.

E. Potherat,⁷ reports the case of death from marasmus of a patient of Trélat at La Charité. His age was forty-two, and he had been a subject of dorso-lumbar Pott's disease for twenty-eight years. There were no symptoms of pressure on the cord at any time. The remarkable thing was the extreme emaciation of the lower extremities, which were very hairy. The autopsy showed that the trophic lesions were entirely independent of the nervous system, and were due to diminished blood supply from triple bendings of the aorta, one nearly at a right angle, another a very acute one, due, probably, to the spinal deformities.

A. B. Judson,¹ calls attention to a practical point in the treatment of Pott's disease. He lays down a rule which he says may read: "The apparatus may be considered as having reached the limit of its efficiency if it makes the greatest possible pressure on the projection compatible with the comfort and integrity of the skin." I would extend this rule much farther than to the treatment of Pott's disease, to which I have often applied it. All cases, acute or chronic, requiring apparatus should be treated with strict regard to the state of the skin, especially at compression points. Often by not attending to this rule the hoped-for good effects of treatment are entirely lost, as the apparatus becomes a great evil to be gotten rid of, as by it the disease or injury may be made worse instead of being bettered or cured.

H. Longstreet Taylor, of Cincinnati,¹⁹ in a paper read before the Ohio State Medical Society, June 15th, speaks of the different methods of treatment in Pott's disease and on the respective advantages of Sayre's plaster jacket, a well-fitting leather jacket, a decubitus, and on the advantages of removing the dressing at night. He also speaks of the well-known difficulties of treating the disease among the poor and ignorant, etc. By far the most important part of his article is upon direct surgical operation for removal of sequestra, *i.e.*, attacking the disease *in situ* with the knife, forceps, and spoon. After referring to the unsatisfactory and dangerous way of opening the abscess only in its most dependent part, far away from

the real disease, he quotes the method of opening above and below, which has been done with great success by König, Wood, Israel, Treves, Dollinger, and others. He quotes Israel's operation, who with his finger detected in a carious condition the twelfth rib, the diseased part of which he removed, and after that took away at least one-half of the twelfth dorsal vertebra. The patient died of septicæmia, but the autopsy showed the abscess to be much shrunken, and healthy granulations occupied the seat of the sequestrum. Treves reported to the Royal Medical and Chirurgical Society of London a successful case in 1884. He explored the bodies of the lowest dorsal and the lumbar vertebræ through a lumbar incision. In one case he removed a large sequestrum one inch by one-half an inch, and the patient's recovery was rapid and complete. Taylor also quotes the remarks made by us in the ANNUAL for 1888, forecasting direct operation *in situ* as one that may probably be adopted in many suitable cases. Some years ago I did an analogous operation in an acute case of gunshot wound. I removed first a large ball from the spinal gutter, then parts of the bony bridges of one of the dorsal vertebræ, going with my finger right to the body of the bone. The parts were well cleaned and the recovery was rapid and complete. A partial paraplegia disappeared almost at once. It would seem, if these operations are sometimes successful in acute cases, that in chronic ones, such as Pott's disease furnishes, they should be still more so. Taylor shows, by dissections, that the fear of opening the pleural cavity is almost *nil*, the walls of the great abscess mostly shutting it off; besides, the posterior mediastinal space separates the pleuræ from each other. The incisions for reaching the vertebræ he also gives in detail.

Verneuil, ¹⁰⁰_{Aug. 23} lecturing upon the treatment of Pott's disease at the Hôpital de la Pitié, makes an analogy between the treatment of diseased joints and the disease in question, the primary object being at first to secure immobility and relief from pressure. He dwells strongly upon the importance of early diagnosis, and speaks of spinal rigidity as being one of the first signs. With early recognition, he thinks an early cure may be hoped for with the patient placed under favorable circumstances. There is nothing as to treatment which has not been before recited in these pages. The time of cure, after early diagnosis, he places on an average at nine months. After gibbosity has formed, the mortality in Pott's

disease used to be 80 per cent., the twenty others recovering with various deformities. He relies, then, on early diagnosis and thinks the mortality has been greatly decreased by ability to thus recognize the affection and by iodoform injections at the osseous points where the disease exists, and not at a distance from it. When abscess exists the prognosis is not so favorable.

The chief article on apparatus this year is one by Charles S. Stillman,^{Oct. 27}¹ entitled "An Effective and Inexpensive Method for the Mechanical Treatment of Pott's Disease." The method is ingenious and the article is profusely illustrated. It will amply repay perusal by hospital men and also by those whose practice is among the poor. The best apparatus often costs least in the end.

Mario Motte (Turin)⁷³⁸^{Sept. 1} says that he prefers the treatment by the Sayre method in cases of kyphosis dependent upon spondylitis. He has had over two hundred cases in hospital and private practice, ranging in age from ten months to fifty-seven years. He has applied the Sayre plaster corset not less than twelve hundred times. He had but two cases of fainting during the application, and these were in adults of thirty-three and forty years, who had been bed-ridden for a long time. Some children sleep during the suspension. In general, and particularly for children, he has found this practice most satisfactory. The time required for successful treatment was from one and a half to two years. The mechanical method often requires to be reinforced by constitutional treatment.

Wilhelm Muralt²¹⁴^{Oct. 1} discusses the treatment of spondylitis after the Sayre method. The usual advantages and disadvantages are fairly considered, and do not differ from those given in last year's ANNUAL, as discussed by various observers. The statistics, however, of the writer are interesting. He followed the histories of forty-nine cases which were treated between 1876 and 1884. Thirty-eight of these were cases of Pott's disease. By means of a printed circular, fourteen presented themselves for examination, and reliable reports, mostly from physicians, were obtained as to twenty-nine others. Six of these had died since leaving hospital either directly or indirectly from the spinal disease. Of the twenty-three remaining twenty may be regarded as cured and three have grown worse. Three were affected in the cervical, seventeen in the dorsal, and three in the lumbar regions. Trauma was given as the cause in nine cases. There were four cases of abscess. Most

of the patients came to the hospital in an advanced stage of the disease. There were twelve boys and eleven girls; fifteen were between three and eight years of age and eight between nine and fifteen. The time of treatment in hospital ranged between six months and one and a half years; one case was in two and a half years. All of these cases were treated after the Sayre method, which is better than others. One must grasp the principles which Sayre teaches and learn to practice them and to persevere. One must not lose patience, and if the object is not attained try again. One need not be ashamed to do this, because Sayre himself in one case changed the bandages five times before they suited him. The cases to which the method is applicable are then pointed out.

In an article by J. A. Comingor, of Indianapolis, Ind.,¹⁹⁸ upon the spinal curvatures, those from spondylitis and those from scoliosis, an entirely different opinion is expressed as to the value of the Sayre method. This is in decided contrast with that of the European authorities, who are almost always enthusiastic about it, after ten years of such experience as I think this country (much to its credit) cannot give. Owing to well-known causes and to density of population, the material to judge from is vastly greater abroad than at home in numbers of cases. When we think that the merits of the method are without question accorded to one of our own countrymen, their value would seem to be so much the more appreciated. Dr. Comingor, however, says that "the crucible of time has analyzed it (the method), and in his opinion it stands in the scale much lower than it did at the outset." He also states that in enthusiastic language Dr. Sayre placed his method above and beyond all others; doubtless that was his opinion then, is it his opinion now? Dr. Sayre¹⁹⁸ answers emphatically in the same journal "*that it is.*" He quotes the histories of many hundreds of cases to sustain him, and says, "I am compelled to be governed by personal experience rather than by the theories and speculations of any medical man, no matter how wise and learned he may be on other subjects." If the innocent are "tortured," as Dr. Comingor says, Dr. Sayre answers that then "the jacket has been *improperly* applied and it should be removed and another one put on *properly.*" Dr. Sayre has not seen the dreadful "fights and faints" which Dr. Comingor pictures, and he concludes, "From daily experience I am more and more convinced of

its infinite superiority over any other plan of treatment yet devised."

A case of trephining the spinal column for angular curvature in the mid-dorsal region is reported. ⁶_{July 14} The patient, aged seven, was in the Hospital for Sick Children, Pendlebury, Manchester. There was accompanying paraplegia. Three lamina with their attached spines were removed at the most prominent part of the projection. The theca of the cord was exposed, and a "buff-colored leathery substance" was found surrounding it at the lower part. This was cut away with scissors.

At first there was some improvement, both in sensation and motion. The operation was performed on January 26, 1888, and by March 17, 1888, the improvement was lost and the patient was practically in the same state as before the operation.

H. C. Wood, ⁹_{Jan. 19, 1890} in a clinical lecture at the University of Pennsylvania, mindful of the good effects of suspension in the treatment of Pott's disease, suggests the incorporation of loops in the plaster jacket, and illustrated his idea with a case in an adult. He says the chest of a well-shaped man is an inverted cone, and any upward strain upon the jacket would naturally be received, not upon any one point, but upon numerous points on the surface of the wall.

The making of the loop is very simple. After the first layer of the jacket is put on, a strong linen bandage is placed at the lateral lower edge anteriorly, and then carried directly up, loosely, over the shoulders and down again to the posterior edge of the jacket. The bandage is then reversed and carried upward and forward, and returned until three or four turns of the bandage are loose over the shoulders, and the same is done on the other side.

Then the exterior layers of the jacket are put on. When the mass is hardened the loops are absolutely secure, and cannot be pulled out except by destruction of the jacket. Seventy-five pounds of extension as accurately measured was borne for four hours by the patient without straining the arms or in any way causing suffering. The patient, after a few days, affirms that he is not only more comfortable in the jacket, but that he can move his left leg (which had become almost completely paralyzed) much more freely.

LATERAL CURVATURE; SCOLIOSIS.

Much, but not much fresh nor new, has appeared in the journals during the year upon this subject. From a review of the literature I infer that the almost unanimous favor given to the Sayre method of treatment in cases of Pott's disease is by no means so accorded to the treatment of scoliosis, and I must here say that, if I understand the matter, Dr. Sayre has been most stupidly (there is no lighter word for it) misunderstood as to the treatment of the two conditions. *The surgical indications for the treatment of Pott's disease are those of extension by temporary suspension and permanent fixation comfortably secured during the process of repair. The indications for the treatment of curvatures without spondylitis are movable apparatus, if apparatus is required at all, so that the equally important adjuncts of gymnastics, massage, and electricity may not be interfered with.* To these ends Sayre uses movable plaster jackets in scoliosis and permanent ones in spondylitis. Of course, the presence of abscess, caries, or other lesion, may call for adaptations in cases of Pott's disease suitable to the especial want.

Ernst Fischer,⁴_{Sept. 24, Oct. 1} in articles upon the treatment of lateral curvature, gives the result of his theoretical and practical studies of the subject. Like many others, the author relies upon systematic posturing and exercise. For example, a scoliotic places himself in a right-angled position by bending forward and resting his head and arms upon the seat of a chair. This seat is high enough to keep the legs at full length when the feet are resting on the floor. A band is placed around the trunk loosely, and from its under portion a "sausage"-shaped cushion is passed. To the ends of this a bag is attached by strings and carries weights according to the strength of the patient and the requirements of the case. The bearings of the weights on particular parts of the trunk are also adjusted to suit the especial end required, and the time for a given posture or exercise is carefully regulated, say three times daily, in some cases, for three-quarters of an hour at a time. When the patient is to move about he grasps a sad-iron shaped arrangement of wood by the handles and goes about, as it were, on all fours, carrying the suspended weights with him, while the supports for his arms are high enough to enable him to keep the knees stiff and the legs extended. This gives the general

idea. There are modifications of several sorts, according to the case.

The space allotted to this article forbids reproducing more of the interesting papers here. Fischer is an enthusiast as to the method, and evidently hopes to exercise the same influence that one of his countrymen did as to what was once considered a necessary detail of antisepsis when he said, "*Fort mit dem Spray*," for he says that "if one will compare the results of his method with the mournful consequences of corset-mail treatment he will join in the cry, "*Fort mit dem Skoliosen-corsett*."

I. B. Reynier²⁴_{July 16} discusses at length, "Deviations of the Figure," and the treatment of ordinary scoliosis. The causes of the various positions assumed or acquired by individuals, the carriage of the head, the movements of the eyes, etc., and their influences on the figure are spoken of. To avoid and correct deviations a system of posturing and exercises are described, by the use of simple means, and some of which are to be aided by the physician.

C. B. Keetley⁹⁶_{Feb.} is of the opinion that scoliosis of any extent is more due to what may be called congenital than to acquired causes, and that it has its true seat in very early deviations of the shapes of the vertebral bodies. He speaks of the points of resemblance between true lateral curvatures and knock-knee, and laments that the former has had no student of their pathology to equal Mikulicz in his studies of the latter. He considers that the osseous changes exist from the first, and that faulty positions, owing to muscular weakness, inequality of the lengths of lower limbs, carrying weights on one shoulder or arm, the one-sided practices of musicians, etc., are insufficient causes in themselves for the production of true scoliosis, and that their influence is secondary. He shows how many people have these defects and practices without being scoliotics, and infers, very logically, that there must be something deeper to produce the so-called disease. He discusses masturbation as an assigned cause, but does not give it much place. An interesting exception to a general rule is quoted. It has been stated by me, and was published in the ANNUAL for 1888, that scoliosis does not occur in fishes or reptiles on account of the forms of their spinal bodies and their equal development, as illustrated by their embryonic aortic arches. Mr. Keetley calls attention to the fact that "a scoliotic gold-fish was to be seen

swimming in a bowl for some years up to the present (1887) in the 'male accident' ward at the West London."

Samuel Ketch,⁵⁹_{Sept. 22} of New York, read a paper on the importance of early treatment in scoliosis. This is another evidence of the now generally prevailing opinion, both at home and abroad, that greater reliance is to be placed "on systematic exercise, gymnastics, posture, and recumbency" than upon other methods, especially in the very young.

T. G. Morton⁶²_{Aug.} recalls, in a lecture delivered at the Pennsylvania Hospital, attention to the importance of examining the lower limbs of patients with scoliosis, and repeats the now well-known methods for ascertaining whether inequalities are factors or not in producing the spinal deviations.

Mario Motta,⁷³⁸_{Sept. 1} of Turin, says, after speaking of the corsets in scoliosis, that he uses movable felt ones if he uses them at all. Better results, he says, followed the use of massage and gymnastics. The following points are to be regarded: (1) the spinal column must be made more flexible; (2) the muscles must be strengthened; (3) the patient must be made self-conscious of the corrected positions, so as to aid in maintaining them. He has succeeded in correcting even deviations of the third degree where the deformities are very marked. Home gymnastics and Swedish gymnastics are strongly recommended under proper directions.

John Ridlow⁵⁹_{Oct. 8, 20} read a paper on "The Early Diagnosis and Rational Treatment of Lateral Curvature of the Spine." He thinks, as a rule, that the condition may be diagnosticated earlier than the time the dressmaker finds it out, and gives the varying circumstances which develop sooner or later. The tenor of the debate which followed, in which, after some demonstrations of various exercises, Sayres, Gibney, Judson, Phelps, Ketch, Anderson, Taylor, and Jacobi participated, was that appropriate gymnastics took the first and most important place in treatment. Phelps called attention, however, to the fact that bone deviations had as much to do with true curvature as muscles, thus agreeing with Keetley, before mentioned in this paper. Jacobi thought that in many of these cases too little attention was given to the individual and too much to the vertebral column. The specialist should remember that there were general causes for local disease (and in this I agree with him), and that the patient should be

treated accordingly. L. H. Sayre is a strong advocate of self-suspension, and is not so wedded to the use of the jacket in scoliosis as he has mostly been thought to be.

V. P. Gibney¹_{Sept. 15} speaks of the treatment of lateral curvature by posture and exercise. He reviews some former remarks he had made as to Bernard Roth's system of ten or fifteen movements, and describes them with more approval than he did at first. R. H. Sayre¹_{Nov. 17} has an article on "The Treatment of Rotary Lateral Curvature." Suspension and posturing are profusely illustrated. The posturing is very similar to that of Roth; at all events, is for the same end. In fact, after looking over the material furnished from the journals for the year 1888, I can say that in no year has more commendable activity been shown in the study of the pathology and treatment of spinal troubles.

The same influences and the same methods seem to be at work both abroad and at home. The views of the once limited specialist have taken a broader range, and all things bearing upon the subjects considered have a fair place. At the same time, with all this fairness, there is a tendency to follow in one given direction, which in its turn may lead to narrow-mindedness and dogmatism. Principles, once established, never change; practice is always changing. There is very much that might be reported which for want of space will have to be left out. Roth, Wolfermann, of Strassburg, Myrop, Jr., von Lesser, Leipzig, Baginsky, Bilhaut, etc., etc., have articles on "Scoliosis" of more or less interest. Round shoulders, the school-bench question, the erect attitude (most learnedly discoursed about by John Wilson,²¹³_{Jan.}) have all occupied attention.

Among the apparatus devised or described in the past year is a perambulator carriage with means for extension and counter-extension, thus combining the fulfilling of indications with good hygienic surroundings. The carriage is described as devised by A. B. Hirsh.¹⁹_{July 7} W. H.

RACHITIS.

With regard to the cause of rickets, there is still wide divergence of opinion between those who can see in it only a remote outgrowth of syphilis and those who acknowledge deficient nourishment as the sufficient cause. Robert J. Lee²²_{Sept. 12} ascribes it to

interference with the functions of respiration. Kassowitz considers the alteration in bone-structure to be the result of an inflammatory process, which might arise in many ways. Comby attributes it to a chemical change in the blood produced by digestive disorders (autointoxication). After a review of several theories of the affection, Gallois¹⁰⁰_{Aug. 25} favors what he terms the eclectic theory of Fournier (which is also that of Broca), that rickets is the expression of a constitutional degeneracy, of which the causes are multiple. Some day we may find the agent, chemical or infectious, which is the proximate cause, the pathogenic elements already referred to being only the remote causes of the disease. The hypothesis of Fournier has this advantage, at least, of bringing to the front the principles of hygiene as the most important and efficacious means of cure. If rachitis exists at all among the rich, it is very rare, and, as Kassowitz observed, when it does occur it is notably less grave than among the poor, proof evident that well-directed hygiene is advantageous in the prophylaxis and cure of the affection. Cheadle⁶_{Aug. 18} considers that all others are subsidiary to one chief cause—bad feeding. Infants fed by hand are extremely liable to the disease, especially if fed upon farinaceous diet. The enlargement of the liver and spleen, which sometimes occurs, he does not consider as essential, but attributes them to intercurrent disease; for example, syphilis. W. H. Peters²⁷¹_{Jan.} reports a case of rickets caused by feeding undiluted cows' milk; by following the advice to dilute the milk one-half with lime-water, the child (eight months old) recovered without other treatment, and became healthy and happy. At the end of three months all signs of the disease had gone, except slight osseous changes.

Edgar Hogben³²_{Aug.} claims that hypertrophic cirrhosis of the liver and biliary hepatitis are very common, a possible explanation being found in the gastrointestinal catarrh which usually exists in rachitic children. S. West²_{Apr. 21} reported to the London Clinical Society several cases of acute periosteal swellings occurring among infants and children in the same family. The swellings came on a few days or weeks after birth and disappeared entirely in about a month. All of the children were nursed; there was no evidence of syphilis or of scurvy. Some of the children presented signs of rickets, and he attributed the swellings to this cause.

Schwarz³⁶⁶_{Bd. 27, H. 4, Oct.}⁵¹ made an investigation upon five hundred new-

born infants in the Second Vienna Obstetric Clinic with reference to the presence of rachitis. The diagnosis was based upon the presence of craniotabes and swelling of the heads of the ribs, the cases being divided into five classes: 1. Those in which the ribs, from the fifth downward, were enlarged, and the skull softened, either in the vicinity of the sagittal suture or everywhere. 2. Those in which the ribs alone were diseased. 3. Those in which the skull alone was diseased. 4. Those in which there was enlargement at the borders of the costal cartilage. 5. Normal cases. Of the five hundred cases, 37.6 per cent. belonged to the first class, 31.00 to the second, 7.2 to the third, 4.8 to the fourth—that is, only 19.4 of the cases were free from more or fewer evidences of rachitic diseases. Investigation into the surroundings of the mothers showed that almost all of them lived under very unfavorable conditions. Of the premature children in this series, 93.3 per cent. of those who were born at the seventh month were rachitic, 81.00 of those at the eighth month, and 80.6 of those at the ninth. There were eleven deaths previous to the age of nine days, and careful examination and experiment in these cases confirmed the diagnosis which had been made during life. Microscopical examination showed great development of the proliferation and columnar cell zones and hyperæmia of the perichondrium. Prepared specimens showed great vascularity in the sub- and periosteal stratum, the newly formed osteoid tissue deficient in lime, and the encroachment of the blood-spaces upon the bony tissue.

Rachitis is very common among the poorer classes in the large European cities. Chalybæus¹²³_{May 1} found among nearly three thousand children of Dresden, brought to him for primary vaccination, 8.4 per cent. suffering with rachitis and 4.25 per cent. with scrofulosis. As regards its relation to syphilitic infection, Cazin and Iscovesco,³⁸⁰_{Nov. '87}; ⁹⁹_{May '84} after an extended study of this subject, arrive, among others, at the following conclusions: The bony lesions in the two conditions either differ essentially or are common to other diseases. Syphilitic bones never present the spongy tissue peculiar to rickets. Rachitic bones never show the characteristic multiple osteophytes of syphilis. Anatomically the two processes are entirely distinct. Syphilis may precede, but cannot be viewed as giving rise to rickets, though it sometimes produces osseous deformities, which may be included within the general title of pseudorachitis.

Moncorvo, corresponding editor, writing of his experience in Rio Janeiro, claims that hereditary syphilis furnishes 60 per cent. of the cases of infantile disease. These and rickets he finds present in 45 per cent. of the children coming under his observation. More than two-thirds of the rachitic children in his practice show signs of syphilis, and it is rare to find a child with hereditary syphilis whose bones are not rachitic.

J. Comby¹¹⁸ reports a case of rachitis associated with congenital syphilis. He rejects the theory of Parrot that "rachitis has no other origin than hereditary syphilis," and claims that the two affections are, pathologically and clinically, easily distinguished from each other. At most, syphilis is only an accessory cause and is merely one of the maladies of infancy, any of which may give rise to the rachitic condition.

Simon, of Nancy,³⁵ considers that inability to walk in infants that have passed the age of twelve to fifteen months is an important evidence of the existence of rickets. He claims that there are mild forms of rachitis, characterized clinically by inability to walk, trouble of dentition, abnormalities of the cranium and of the extremities, which, although rarely recognized as such, possess real diagnostic significance in rachitis. Grancher²¹² considers that children who are late in learning to walk may have defective development of the nerve-centres presiding over this function. Among the affections which delay walking he places in the first rank those which affect the medulla or brain, such as hydrocephalus and cerebral sclerosis. In the case of a child, three years of age, which had never walked, he discovered general defective development; sensibility was obtuse, and intelligence only rudimentary. The cause was obscure, but it was supposed to be congenital cerebral sclerosis, as the mother was an acknowledged alcoholic.

Treatment.—In addition to cod-liver oil, iron, and the hypophosphites, clinicians continue to speak with much favor of the phosphorus. Jacobi, of New York,⁵¹ usually gives the officinal oleum phosphoratum, which is a 1 per cent. solution. J. de Montmollin¹¹⁶⁶ declares that no other remedy can be compared with it, especially in its influence upon the nervous manifestations of rickets.

Comby³⁵ lays stress upon the smallness of the dose required; he gives to infants about one milligramme ($\frac{3}{200}$ grains) daily, with

about eight to ten grammes (two to two and one-half drachms) of cod-liver oil. The treatment should extend from three to six months or more. Tedeschi¹¹⁸ combines with this the application of galvanism to the spine and finds that he obtains better results than with the phosphorus alone. Hochsinger¹¹³ points out a possible source of failure, due to the fact that unless the oily solution be properly made the phosphorus will all be left behind in the manipulation so that the resulting preparation will contain none of it. Hartwig,⁵⁹ of New York, is also enthusiastic over the phosphorus treatment, but advises periods of rest, for a month at a time, in the administration in order to prevent granular degeneration of the liver, the danger of which was pointed out by Wegner.

Lesser⁸⁰ has used for ten years in six hundred cases of rickets the following mixture:—

R	Tinct. rhei. vin.,	.	.	.	.	.	.	.	20 parts.
	Sol. pot. acet.,	.	.	.	.	.	.	.	10 "
	Vin. antimon.,	.	.	.	.	.	.	.	5 "
M.	Sig: In the 1st week take 8 to 10 drops three times a day.								
	" 2d	"	12	"	"	"	"	"	"
	" 3d	"	15	"	"	"	"	"	"
	" 4th	"	18	"	"	"	"	"	"
	" 5th	"	20	"	"	"	"	"	"

ASYMMETRY OF THE LOWER EXTREMITIES.

An example of marked inequality in the length of the lower extremities in the case of an adult, whose right limb was two and a half inches shorter than the left, was presented by me to the Philadelphia Academy of Surgery. His history did not show that there had ever been any attack of infantile or other paralysis, or any other disease or injury, to account for the arrest of development. The strength of the limbs was equal and there was very slight difference in volume when the two limbs were compared. At the same time, the reporter exhibited an apparatus which he had devised for accurately measuring and recording any observed difference in the length of the lower limbs.

The apparatus consists of a box, or stand (much better understood by referring to the figures than from a description), which is twenty inches in length, sixteen inches wide, and eighteen inches high, mounted on rollers. Set into the top of the box are two movable blocks, or small platforms, accurately fitting side by side.

These blocks are sixteen inches in length by five in width. To the under surface of each are attached strong vertical and horizontal screws, the latter projecting on each side of the box, where they are fitted with handles, by turning which the platforms are elevated gradually to any desired height up to six inches. The manner of using the apparatus is as follows: The subject to be examined stands with his back toward the examiner (Fig. 1), with his

FIG. 1.

FIG. 2.

feet accurately placed upon the blocks. An assistant, then, by turning either handle, can gradually raise the corresponding side of the body. If the longer limb is raised it will exaggerate the deformity, whereas if the shorter limb is raised the deformity will entirely disappear as the subject becomes "lined up" (*i. e.*, in parallel line—see figure), as the mechanics say. This is manifested and can easily be recognized by watching the spinal column, the cleft of

the nates, and the ileofemoral fold upon each side. When the spinal column and the cleft of the nates are perpendicular and the horizontal folds between the buttocks are at a right angle with the median line of the body, and the limbs appear symmetrical, the indicator at the side of the box will show the amount of shortening, or the difference in the length of the lower limbs (Fig. 2).

This apparatus has been for some time in use at the Orthopædic Hospital, of Philadelphia, where all cases of spinal curvature, infantile palsies involving the lower limbs, and deformities are subjected to careful examination for asymmetry. It has been found here that by means of this apparatus any inequality of the length of the lower limbs can be at once demonstrated and its degree accurately determined.

Bilhaut, of Paris, ⁰¹_{Apr. 10} reported at the Third French Surgical Congress several cases of scoliosis due to unequal growth of the lower limbs. He referred to the paper read by me before the Ninth International Congress, with the conclusions of which his own experience coincided. The rational treatment, according to Bilhaut, is to equalize the length of the limbs and to strengthen the unequally developed member by gymnastics, electricity, and hydrotherapy. Orthopædic corsets may be required to maintain the results.

In Hartwig's studies of the upper extremity, communicated to the Society of Anthropology in 1874, asymmetry was found to be the rule, the bones of the right arm being the longest. Poncet ²¹¹_{Jan. 75} has recently reported a case of alternate inequality, the right arm and the left leg being better developed. He also refers to my paper, and points out the fact that the symptoms of inequality of the lower limbs may simulate those of coxalgia; it is sufficient, however, to be warned of this error in order to avoid it. Ollier, in the discussion of Poncet's paper, stated that, on the other hand, infants are frequently supposed to merely have inequality

OUTLINE OF THE BACK OF A
SYMMETRICAL HUMAN
BODY.

Base vertical lines, *a a*, *a a*.
Base parallel lines, *b b*, *b b*, *b b*.

of the limbs when in reality they are suffering with coxalgia or a scoliosis.

Staffel ⁶⁹_{Apr. 26} points out a possible cause of failure, in stating that equalization of the length of the limbs when asymmetry is the source of the deformity is not enough by itself to cure the condition; if the case be otherwise neglected this will only eventuate in still greater curvature. He advocates the use of the orthopædic corset "as long as the patient can sit up straighter with it on than when it is off."

Pathological Lengthening of Bone.—H. Earnest Goodman showed at his clinic a case of pathological lengthening of the tibia following traumatism in a boy, fifteen years of age. The effect was to evert the foot, turn the knee in, and tilt the pelvis so as to produce a lateral curvature of the spine. T. G. M.

WRYNECK.

C. B. Keetley, of London, ⁹⁶_{Apr.} speaks of the ambiguity of the term, and says that contracture of the sternomastoid is coming to be the only affection entitled to the name. "Therefore," he says, "by wryneck I mean contracture of the sternomastoid." The affection may be congenital or acquired. "When a wryneck has actually developed, the sooner the sternomastoid is divided the better. This may be done either by the subcutaneous or the open method," for which the ordinary directions and cautions are given. Extension and counter-extension are made by weights attached by adhesive strapping to the head and upper arm respectively. The weight extension should be kept up for a month or more, and regulated by the size and strength of the patient. From two to seven pounds may be borne with comfort. After the extension is removed manipulation is in order.

Schmitz ²¹_{Feb. 18} presented a boy of five years before the meeting of St. Petersburg physicians upon whom he had performed a plastic operation for the relief of congenital wryneck. He objected to the usual methods of transverse division of the sternal and clavicular ends of the muscle, and said that the subsequent cicatricial contraction often defeats the object of the operation. He, therefore, by step-shaped ("treppenformig") incisions of the muscle, the first on a level with the angle of the lower jaw and from within, the second from without and three centimetres below, and

then connecting these by a longitudinal incision, was enabled to lengthen it three centimetres. The parts were sutured by cat-gut and a plaster bandage applied, thus securing the head in the correct position. It was worn eleven days. The result was excellent. Light passive and active gymnastics were kept up for some time without any further use of the apparatus.

Bransford Lewis¹⁰⁹_{Mar.} reports a case of acute torticollis admitted to the St. Louis City Hospital. The patient fell on his side and experienced a slight pain on the left side of the neck, which was not directly injured. On turning in bed the next morning he twisted his neck so that the face was turned downward and to the right, and the patient himself could not correct the position. By extension and rotation this could easily be done. A high plaster collar was used and worn for six days, after which the patient had no trouble in maintaining the proper position.

I had a similar case, occurring in a young lady. It was impossible for her to move the head, which was in the same position as described above. Extension and rotation was applied with success. Personal watchfulness, without apparatus, completed the cure in a few days.

John D. S. Davis, of Birmingham, Ala.,¹_{Feb.}, has decidedly the most interesting and instructive paper published during the year upon congenital torticollis. The subject is treated of historically as well as pathologically. There are three classes coming under consideration for treatment: (1) those *not* susceptible of material improvement; (2) those capable of considerable improvement, but not complete rectification; (3) those which may be completely cured. There is little difficulty in selecting the incurable. There is in them always osseous as well as muscular involvement, dependent upon intrauterine changes of the vertebræ, rickets, or Pott's disease. Many of the second class would have been amenable to perfect cure in the early stages, but, having waited years before submitting to treatment, malformations of the vertebræ have gone on *pari passu* with the contracture defects, and the opportunity for complete cure has been lost. Nevertheless, most of them may be greatly benefited. The last, or curable class, covers all cases in which there are no osseous complications. Shortened muscle, from whatever cause, may be divided with perfect results.

I would call attention to the method (devised by Schmitz,

quoted above) of dividing and lengthening the muscle in the severe cases, as appearing to me well worthy of further trial.

Dr. Davis arrives at the following conclusions as the results of his practice and clinical experience: (1) that it is rare and doubtful if ever congenital torticollis is produced through the act of delivery, resulting from faulty application of the forceps, or from pulling out the trunk before the head is extracted; but that the cause may be found in the low vitality of the foetus of scrofulous parentage; (2) that complete resection of all the contracted (contractured) tissues is necessary before attempting to restore the head to its normal position; (3) that after complete section of the tissues the head should be placed in its normal position and retained there for ten or fifteen days.

HIP-JOINT DISEASE.

The literature of the past year upon this subject chiefly consists of reports of unusual and interesting cases and of recommendations of modified apparatus.

E. H. Bradford⁹⁹_{Aug. 16} reports "two cases of incision into the hip-joint with observations as to 'distraction' in hip-disease." The word "distraction" refers to the ability to separate the head of the femur from the articular surface of the acetabulum by extending force, and is etymologically correct, though not in common use with such a meaning. I do not know who introduced it into the literature of the hip-joint, but think it is an unnecessary additional burden put upon that structure, which already has enough to bear.

The two patients of Dr. Bradford were children, one of six, the other of four, years of age. The disease was in its early stage in both. Both had "night cries" to a more than ordinary degree. The first was neither benefited nor aided by the incision, which was made behind the trochanter major. The second was operated on in the same way and some pus was evacuated. He states that it cannot be claimed that the amount of benefit obtained warranted the interference.

Extension and fixation will generally check the night cries and carry out the other indications. The interesting part of the report is about "distraction." In the second case the femur could be pulled away from the acetabulum after the capsule was divided, so that after a slight pull the finger could be inserted between it.

and the head of the femur. Both were found to be covered with granulations. From experiments afterward made at the Harvard Medical School to determine the cause of resistance to a distracting force, it was demonstrated that the cotyloid ligament, acting as a cartilaginous collar, is the chief agent which secures the head of the femur in its tight socket.

With a direct pull in the line of the axis of the body, the cotyloid and the Y-ligaments prevent "distraction," but if the limb be slightly flexed and abducted "distraction" may be produced, and if it be adducted and a pull be made in the line of adduction it will bring the femur in a line with the acetabulum. These experiments show that the influence of atmospheric pressure is not so great as has been supposed. It is to be borne in mind that in young children the cotyloid ligament is not so developed nor so strong as in adults, also that the acetabulum is much smaller and its rim cartilaginous.

A case of "Hip Disease, Unusual Causation," is reported by Henry G. Rawdon.¹⁸⁷ The patient, aged six and a half years, had a large abscess and symptoms of hip disease. He had a fall twelve months before the symptoms appeared. Six weeks before admission violent convulsions set in. He had never had convulsions before.

The joint was incised, much pus was evacuated, and the capsular and round ligaments were found to have given way. The bone was only diseased to a small extent. The boy mended slowly and then became stationary after four months. Sinuses had formed, which Mr. Rawdon opened. He found no necrosed bone, but the inner portion of the upper third of the thigh was enlarged and there was an obscure sense of fluctuation, giving the idea of deep pus. On firmly compressing the part a large mass of solid fæcal matter was squeezed out which was over three inches long and three-quarters of an inch in diameter. The mass, Mr. Rawdon believes, was lying between the vastus internus and the adductors, and had been there for several weeks. The nurse said she had frequently noticed bubbles of air escaping, with particles of brownish matter from the outer sinus. The explanation is that the patient must have had an attack of typhlitis, and that there was perforation and pus leading through the obturator foramen, thus forming a track for the subsequent passage of fæces. The patient made a complete recovery.

At the New York Academy of Medicine, May 18th, R. H. Sayre,¹ advocated the early opening, under antisepsis, of abscess of the hip-joint, together with a thorough cleansing and scraping of the cavity. This gave rise to an interesting discussion in which the conservative method was advocated by some, and by others the plan pursued by Sayre.

The latter plan has still to go through the ordeal of extended experience, but enough has been established to give great encouragement in its favor.

A case of hysterical coxalgia in a soldier is reported by Zenon Glorieux, of Brussels.⁵² A short history of the affection is given in which Brodie, Charcot, Klein, Mossé, and Batault are quoted. The case itself is given very fully. The interesting point is that it was referred to a commission, the report of which (by Hambursin⁵² v. 2, No. 2) concludes that "the cause, the mode of origin, the semiology, all cause us to reject the diagnosis of hysterical coxalgia, and to consider the case due to a grave lesion of the right cerebral hemisphere." The final outcome of this case will be of great interest.

New Apparatus.—A. R. Jenkins, of Henderson, Kentucky,⁹⁸ describes a padded board stretcher in the treatment of hip disease and various traumata. Otto Thilo, of Riga (Russia),⁷³⁸ advocates a cloth corset with hip supports for congenital luxation of the hip. Cazin, Berk-sur-Mer,⁷¹ describes an immobilizing bed for the treatment of coxalgia. A. J. Crawford, Des Moines, Iowa,¹⁰¹ reports a case of hip disease and presents a new hip splint.

W. H.

CLUB-FOOT.

The literature of club-foot has been quite full during the year, and perhaps has been more labored than advanced. Phelps' operation, with open incision and immediate restoration of the foot, is advocated by some, while others strenuously insist that tenotomy is rarely if ever required, and should, at all events, be deferred until the limits of advantage to be gained by manipulation and mechanical apparatus have been reached. Among the able contributions in favor of immediate or rapid restoration after operation (tenotomy or tarsotomy) are the papers of Howard Marsh,⁶ Noble Smith,⁶ Charles Dixon Jones,⁹ W. J. Walsham,⁶ R. W. Parker,² Alexander Ogston,² and George R. Fowler.¹⁵⁷ Among

those claiming that the main reliance in treatment must be mechanical are Heinecke,³⁴ David Prince,¹⁰⁹ Newton M. Shaffer,¹ T. H. Squire,⁶⁰ and C. McReynolds.¹⁴³

Swan,²² in an interesting paper, has well summarized the indications for treatment. He declares that all cases of congenital equino-varus are perfectly curable by the recognized and scientific treatment, if it be thoroughly carried out before the expiration of the first year of life. After three or four years have elapsed a modified result may be obtained, and the degree of success will depend upon the condition of each individual case and the tendency to relapse will extend over a lengthened period. When the person has reached the age of ten years features are presented which preclude the hope of success being attained by tenotomy and extension; the tarsal bones are thickened and the typical distortion is increased. As the metatarsal bones have their epiphyses at the distal end, it is probable that the development of the foot would not be interfered with. In such a case there can be no other means adopted than ablation of a portion of the tarsal bones, although, in many cases, an atrophied condition of the anterior part of the foot renders such an operation useless and unjustifiable. The portion removed will consist of the anterior three-fourths of the cuboid bone, all the external cuneiform, except its posterior part, the proximal extremities of the third, fourth, and fifth metatarsal bones, and the apex of the wedge will consist of a portion of the middle cuneiform. The mobility of the foot will remain almost unimpaired.

Almost identical views are expressed by E. H. Bradford, of Boston,⁵⁹ in a paper read before the American Orthopædic Association. Infantile club-foot can, as a rule, be efficiently treated without tenotomy by mechanical correction and retention; but in older cases he holds that tenotomy aids the correction and is not injurious to the final result. Some resistant cases of the severest type can be corrected without tarsal osteotomy, whilst in others tarsal osteotomy is needed for complete rectification. It is not only justifiable, but is indicated in exceptional instances.

In the article on congenital talipes varus, already referred to, George R. Fowler¹⁵⁷ insists upon the importance of the very early treatment of this deformity, the infant foot immediately after birth being exceedingly pliable and more readily restored to the normal

shape than at any later period. The treatment should begin within a few hours after birth ; it consists in the proper application of porous plaster and of plaster of Paris, as follows: one end of a strip of perforated adhesive plaster, an inch in width, is placed across the anterior part of the foot ; starting on the dorsum at the metatarsal bone of the little toe, it is carried around the base of the great toe, across the sole of the foot, and up the fibular side of the leg extending above the knee, the end being there held while the foot and leg are encased in a flannel bandage. The foot may then be retained in the natural position by a dressing of plaster of Paris. By this method the foot is restored to a normal position, and tenotomy, if required at all, will be confined to the tendo Achillis. The author considers the general subject of tenotomy in those cases where treatment has been delayed, and condemns the early division of the heel-tendon, which permits simply a lateral deviation of the foot but does not alter the condition of the tarsal bones. He prefers, with regard to other tendons that are occasionally rather difficult to find, that they should be exposed by free incision ; since recent advances in wound treatment justify this course, which certainly enables the surgeon to perform tenotomy much more effectually. Fowler, in every operation for cutting tendons, except the tendo Achillis, prefers the open incision, lifting the tendon upon a blunt hook and dividing it completely, and having the assistance of the eye at every step of the operation. With antiseptics all wounds are brought to the condition of subcutaneous wounds. Among others who have adopted this method is Siegfried Levy,³⁷⁵ of Copenhagen, who has reported six cases in which this operation was performed, and in all with excellent results.

The opinion now seems generally to prevail that the treatment of club-foot should commence very early ; indeed, I am accustomed to begin it as soon after birth as possible. The foot deformity should be forcibly corrected, the foot then placed upon the light tin splint already described, and held in position by a flannel bandage ; the splint should be removed daily, the foot washed, stretched, and then replaced on the apparatus. Very seldom, indeed, is tenotomy required ; certainly, with proper care, all varus can be overcome, though when the child is ready to walk the heel tendon may require division, with immediate restoration of the parts to their normal position. The child should be encouraged to

walk almost immediately after the operation in order to insure sufficient separation of the divided tendon and ankle motion.

Parker,² in a paper read before the British Medical Association, has found shortening of the ligaments of the foot in club-foot a constant condition. The bones were not always altered in shape. In early talipes a change of shape of the astragalus in the nature of a reversion to the simian type was common. Pressure alters the relation of the bones to each other and excision should not be contemplated unless in very late and severe cases.

Ogston,² advises forcibly moulding the infant foot until it refuses to assume a deformed position, applying a plaster-of-Paris dressing retained for six weeks. He has gototomies by subcutaneous section and does not approve of wedge-resection of the tarsus; excision of the ligaments offers better rectification than any other operation.

Shaffer,¹ divides congenital club-foot into three varieties: (1) muscular, (2) ligamentous, and (3) osseous; but these cannot be distinguished clinically. The mode of treatment which he advocates is to start with traction apparatus and if, after a sufficient length of time, the deformity does not yield to this, to proceed to tenotomy and subcutaneous division of the ligaments, and then to resume traction as before. Under this management he thinks that open incision and osteotomy will rarely be called for.

TIN SPLINT FOR CLUB-FOOT IN INFANTS.

Tin splints have long been used in the treatment of club-foot in infants; they should be made so that the foot part of the splint is absolutely flat and standing at a right angle with the leg-piece. A splint on this principle, though made of wood, was extemporaneously made by Hawes¹¹⁶³ and successfully used in a case of club-foot.

The curve in the foot part of the perforated tin splint recommended by Lewis²²⁷ permits the foot to slide to one side and so

may allow of a recurrence of the deformity, and for this reason should not be used in the treatment of infantile talipes.

After equino-varus has existed for years and the extremity has been walked upon the condition becomes inveterate, and in such a case there may be no other resource than the breaking of the tarsus, the removal of a portion of the tarsal bones, either by extirpation of the cuboid, as first practiced by Davy, or the taking of a wedge from the foot, as performed by Swan¹⁶_{Sept.} in thirty-four cases with good results. In a young subject Swan finds that a strong knife and a sharp chisel used by hand will suffice; at a more advanced age Hey's saw or the mallet and osteotome will be needed. David Prince, of Jacksonville, Illinois,¹⁰⁹_{May} prefers the chisel for removing a portion of the tarsus.

In a case of a child five years of age, upon whom tenotomy had twice been performed unsuccessfully, Richet¹⁴_{July} operated and removed the astragalus after a preliminary division of the tendo Achillis. In order to completely reduce the deformity, it was found necessary to remove also the anterior part of the calcaneum. A good result was obtained.

Extirpation of the astragalus is the subject of a paper by Heinrich Heinlein,³⁴_{Sept.} in which three cases are reported; in two it was done for caries, in the other in order to reduce a compound dislocation of the foot. George Buchanan²_{v. 2, p. 288} describes a method of removal of the astragalus which was practiced by his father forty years ago: "A semilunar incision is made below the external malleolus, beginning at the edge of the tendo Achillis and extending to the tendon of the peroneus tertius. The tendons of the peroneus longus and brevis are divided. The fasciculi of the external lateral ligament are cut, when the foot can easily be twisted inward, the upper articular surface of the astragalus now looking outward. The interosseous ligaments between the astragalus and os calcis are divided with the point of the knife and the astragalus grasped with a lion forceps. It can now be wrenched from its place, any ligamentous fibres which attach it to neighboring bones being cut. Little hæmorrhage takes place, and the foot can now be replaced and will be found readily to assume a position at right angles to the leg, with the sole in a normal state. In this position it is secured by a suitable splint, and the wound treated antiseptically."

Charles Dixon Jones,⁹ advocates tenotomy by the open method, extending the incision to a linear section of the astragalus and other bones of the tarsus, if necessary, to obtain complete redressment of the foot. H. B. Sands,¹ presented before the New York Surgical Society a child, twelve years of age, who had had exaggerated congenital deformity of the foot (equino-varus with extreme supination) which he had entirely relieved by removing a wedge from the tarsus.

The morbid anatomy of congenital talipes equino-varus has been well presented by J. B. Bissell,⁵¹ who draws the following conclusions: "1. The shape of congenital equino-varus is due primarily to bone changes. 2. The varus is due to the elongation of the calcaneum, to the excurvation of its outer face, to the extreme obliquity of the neck of the astragalus, and to the distorted position and the shape of the scaphoid. 3. The equinus is due to the great increase in the depth of the anterior portion and to the thinness of the posterior extremity of the astragalus. 4. The deformed foot is also retained in its abnormal position by the alterations in the ligaments, tendons, and fascia; these alterations being secondary to the changes in the bones."

The relation of club-foot and other deformities of the lower extremities to certain lesions of the nerve-centres, and especially to spina bifida, has been frequently noted. Pillict⁷³ has described a case in which general degeneration of the cerebro-spinal axis was cited as the cause of double club-foot. Jules Simon,¹⁰⁰ in a lecture on the causes of lameness, lays great stress upon the importance of recognizing the exciting cause in each case. Among them he cites coxalgia, reflex contractions of muscles, abscess, congenital luxation of hips, affections of the knee-joint, infantile paralysis, and central lesions.

Prevention of Traumatic Aneurism After Tenotomy.—F. R. Fisher,⁶ condemns the practice of applying complete immediate extension to the limb after subcutaneous operations upon the plantar fascia or tenotomy of the tibialis posticus, because in case an artery is accidentally injured it will heal without forming an aneurism if the foot is left in the position of deformity for a few days before instituting restitution and extension. A case in point has been reported by Walsham,⁶ of aneurism of the internal plantar artery following the division of the plantar fascia for club-foot, which

occurred in the case of a boy of seven. The plantar fascia was divided in both feet; the puncture was made rather far back in the sole. In the left foot quite a smart hæmorrhage followed the puncture. This was controlled by pressure and plaster-of-Paris dressings applied. When these were removed, two weeks later, the wound was soundly healed, but an aneurismal tumor was present as large as a marble. Cure took place by pressure, which was maintained over the posterior tibial artery altogether for about two months. The writer is cognizant of no other similar case, and attributes the aneurism to the fact that the mother allowed the boy to walk before the parts were consolidated. He is of the opinion that a wound of the artery is not an uncommon accident.

Non-union After Resection.—Marsh² exhibited a boy before the Midland Medical Society upon whom resection of the tibia had been performed for marked curvature of this bone, and non-union had resulted. The limb was one and one-half inches shorter than the other one. The rarity of non-union of bones in children was referred to; in this case it was attributed to local causes.

FLAT-FOOT.

Royal Whitman, of Boston,⁹⁹ in a paper read before the American Orthopædic Association, attributes flat-foot to overweight or overwork for feet subjected to mechanical disadvantages; prominent among these are the habit of turning out the toes, and weakness of the muscles due to disease, or to the effects of wearing improperly fitting shoes. Regarding flat-foot as a dislocation, he treats it by reposition and retention in the normal position until the muscles regain their strength by exercise and by the use of some form of mechanical support, which should be light, elastic, and comfortable, fitting the foot perfectly, and at the same time not interfering with the action of its muscles. He has devised a brace, which is made of thin, tempered steel, accurately moulded on a cast of the foot, to the plantar surface of which it is adapted, extending also upward for a short distance on each side of the foot. It is intended to be worn outside of the stocking. Pressure upon this in the act of walking tends to throw the weight more on the outside of the foot and to turn the toes inward, thus resisting the exaggerated abduction. Well-fitting laced boots of the Waukenphast pattern, with broad soles and low heels, should be worn. In

some cases the weak ankle may be favored by raising the inner side of the heel and sole by placing under it a strip of leather, which should not extend beyond the ball of the great toe. He believes that in many instances flat-foot might be prevented by teaching children that the proper attitude for the feet is with little if any divergence of the toes, in standing or walking, and the avoidance of improperly constructed shoes. The proper shoe will have a sole wide enough to support the foot and allow the toes to assume their natural position.

Weinlechner, of Vienna, ⁸⁴_{Mar. 10} performed extirpation of the astragalus for the relief of a severe grade of flat-foot in a man twenty-four years of age. The patient made a good recovery, and was exhibited before the Society of Physicians of Vienna. There was a shortening of the extremity of, at the most, not more than one and a half centimetres; the foot had good shape, and the patient was able to walk without pain. There was only slight movement of the metatarso-phalangeal articulation. Weinlechner considers this the first patient upon whom extirpation of the astragalus had been performed for the relief of flat-foot. It was stated that Billroth has subsequently performed the same operation.

Extreme operative measures, however, are not often required. T. E. Ellis, ²_{June 30} in a paper on "Preventive Surgery, as Illustrated in Knock-knee and Flat-foot," points to failure of muscular support as the primary cause of these affections, and declares the leading indication for treatment to consist in strengthening the action of the muscles which, in the full exercise of their functions, tend to prevent these deformities. He states that he never uses support of any kind in treating flat-foot, considers tenotomies unwarrantable, and denounces osteotomies and resections as unjustifiable mutilations.

This whole subject has been well summed up in a paper read before the New York Academy of Medicine last March by Bernard Roth, ¹_{June 16}. He began with the statement that some of his views had materially altered within the past two years. He defined flat-foot as a falling down of the normal arch of the foot, which might be so slight as to escape notice except from the discomfort it caused, or so severe that the whole tarsus was as convex inward as it ought to be concave, and that the foot was so everted that the internal malleolus touched the ground while the outer

border of the foot was raised, with the sole directed outward, as in some cases of infantile paralysis. The best classification was: (1) cases in which it was possible to restore the foot completely by passive manipulation or by making the patient stand with the heel raised; (2) cases in which the tarsal bones had become more or less fixed in their displaced positions by shortened ligaments and tendons, osseous deformity, and fibrous or osseous ankylosis, which required forcible manipulation to restore the arch; (3) intermediate cases.

All infants on commencing to walk were normally flat-footed, whereas after they had run about a few months, and the leg muscles have become developed, a perfect arch was formed. Anything which tended to weaken the general muscular system during the years of growth would also predispose to flat-foot. Hence its prevalence in lateral curvature and knock-knee. When the muscles failed to do their work, undue strain was thrown upon the tarsal ligaments and they gradually yielded. As long as no osseous malformation had developed more or less complete restoration to the normal condition was possible. The production of osseous deformity in the foot was brought about in the same way as in knock-knee.

In the treatment there were two indications: (1) to restore and preserve the normal plantar arch; (2) to strengthen the muscles which tended to produce and preserve the normal arch. Thus, mechanical means for replacing and keeping up the arch, and therapeutic methods for strengthening the weak tibial muscles, must be discussed. In the first and third class of cases a boot or shoe should be worn broad enough across the metatarso-phalangeal articulations; the heel should be low and broad. The increased thickness of the sole was from one-fourth to one-half an inch, according to the severity of the case. This wedge-shaped sole and heel could be applied to boots and shoes already made. In class two, *brisement forcé* was required.

As to therapeutic measures for strengthening the tibial muscles, walking on the toes with the heels raised an inch or so, and special gymnastic exercises for developing the muscles which tended to preserve the plantar arch, was all that was necessary. The removal of a wedge-shaped piece of bone from the tarsal arch did not appear to him justifiable. He had not seen a case

in which this treatment offered reasonable probability of permanent benefit.

KNOCK-KNEE AND BOW-LEGS.

Referring to the revival of the treatment by operation by Macewen, of Glasgow, and others, Sidney Roberts⁹_{Feb. 18} discusses the indications for the mechanical methods of treatment, which he regards as being quite as important as the more radical measures that have been resorted to. In addition to appropriate support he pays especial attention to the bodily health, prescribing the diet, clothing, and bathing of the child, recommends sun-baths and exercise, and, in short, follows a restorative plan of treatment in which he finds great assistance from the hypophosphites, iron, and phosphorus. In many cases he discovers localized rachitis. For such cases he applies an elastic traction brace which is to be worn at night, the ordinary support being worn during the day. This he has found to rapidly overcome the tendency to bowing which is caused by the hypertrophied internal condyle. Upon one case of extreme unilateral genu valgum in a colored boy, five years of age, he performed osteotomy, this being the first time the operation had been done in the Philadelphia Hospital. Two weeks later he performed successfully a double operation, by Macewen's method, on a little colored girl, who was also five years of age.

Arbuthnot Lane⁴²⁸₁₈₈₇,⁹⁹_{June 7} considers the origin of many of the common deformities to be mechanical and brought about by the child habitually assuming what he terms "attitudes of rest." In the case of knock-knee, for example, in the erect position when the heels are together the femur and tibia form an angle open outward, and the external condyle transmits the body weight more than the inner one. A persistent assuming of this position, or even a more extreme one, with the feet apart, by even a healthy child, would be apt to lead to atrophy of the cartilage of the external condyle where the pressure comes and hypertrophy of the inner one. The treatment of early cases should be to raise the inner side of the sole. With regard to rachitic deformities of the legs the ordinary cause is asserted to be a rotation of the sacrum, apparently in consequence of the flexed spine. The pelvis rotates secondarily; the iliofemoral ligaments are consequently strained upon and the child stands with thighs necessarily flexed. In this position the weight of the body falls inside the knees, and a ten-

dency to bow-legs results. The treatment should be extension of the thighs and pelvis in the recumbent position.

The same ground is taken by Milton J. Roberts, in which he reviews the different forms of deformity and describes new procedures for their relief. Among the clinical forms he points to a combination of bow-leg and knock-knee in the same individual, a genu varo-valgum, which he had not seen described, but which he is sure must be quite common. His case was cured by the use of apparatus. In some cases the cause of the affection is evidently a temporary disproportion between the weight of the body and the strength of the limbs. It is not uncommon to find in such cases that the child will outgrow the deformity, and its legs will straighten out as it gets larger and stronger. In others, where softening of the bone-tissue has already occurred, early treatment by rest and a retaining apparatus will lead to cure, as in a case under the care of Rabagliati²²_{Apr. 4} at the General Infirmary of Bradford of a boy of fifteen years, who was cured of incipient genu valgum by long splints and rest in bed in less than a month.

John H. Deaver, of Philadelphia,⁶²_{Jan. 1} performed an osteotomy by the subcutaneous method, dividing the femur at a right angle from below upward so as not to injure the artery.

Bell, of Montreal,¹³⁰_{Jan. 1} exhibited a child, three and a half years of age, before the Montreal Medico-Chirurgical Society, upon whom he had operated for bow-legs, the result of rickets. He had performed double osteotomy by Macewen's method and obtained a very favorable result.

G. W. Ryan, of Cincinnati,⁵³_{Jan. 28} in a similar case performed a double osteotomy by Poore's method.

As regards the safety of these resections, C. B. Kectley⁶_{Feb. 11} states that he feels less fear now about opening and examining the knee-joint than he felt ten years ago about excising a fatty tumor. He ascribes this to the introduction of antiseptic dressings, accurate approximation, the use of drainage tubes, and absolute fixation after operation, which is secured by plaster of Paris.

A modification of Macewen's operation has been practiced by Brenner,²²_{Feb. 29} assistant to von Dittel. He recommends that the operation shall not be done from within outward, but from without inward. He advocates a small incision about five centimetres above the epicondyle, into which he introduces a small chisel with

which the bone is cut nearly through, and the remaining portion is then broken, the advantage being that the periosteum is saved. The limb is at once placed in proper position and kept immovable by plaster-of-Paris dressings. In two cases treated by this method recovery took place after eight weeks.

Motta ⁴⁴⁶_{v.4,p.179} advises against complete correction of the deformity and recommends the use of counter-extension by weight (from ten to fifteen pounds) after the operation of bone section. Lorenz ¹¹³_{May 12} prefers osteoclasis, and presented two cases before the K. K. Gesellschaft, of Vienna, in which it had been successfully performed for genu valgum by the use of Robin's osteoclast. He thinks that his operation is particularly applicable to young persons below the age of twenty years; above this age he prefers osteotomy. D'Ambrosio, of Naples, ⁶⁹_{p.28} also advocates osteoclasis as the safer operation; but on the other hand, Bassini ⁸_{Apr. 11} reports that out of ninety-nine cases of genu valgum operated upon by him he performed osteotomy ninety-seven times and osteoclasis twice, and it was only in these two that fever occurred. Richard Davy ⁶_{May 6} reports the results of sixty-four operations in which he had performed Ogston's operation of sawing the inner condyle nearly through, and then fracturing it so as to bring the limb at once into good position. The sixty-four operations were upon forty-two patients, nineteen males and twenty-five females, from two to thirty years of age. He has introduced a slight improvement in the operation by having a deep groove on the back of the tenotome, which acts as a guide for the introduction of the saw. He claims that Ogston's operation is a safe and efficient remedy in young subjects for the relief of genu valgum. The operation, it is true, requires some dexterity and minute attention to detail; in short, should be undertaken just like any other subcutaneous operation. Rest should be insisted upon, and no persuasion (short of impending gangrene) should induce us to interfere with the leg and splint until three weeks after the date of the operation.

Brown ⁹⁹_{June 1} summarizes his experience in much the same words, but favors osteoclasis. In rachitic deformities he would only operate after the bones had become eburnated. He lays down the following principles of treatment: 1. In children under two years of age, in which the deformity is not exaggerated, the expectant plan, possibly with frequent daily attempts at correction with the

hands. 2. In older children, in which the bones are yet soft, some form of mechanical support. 3. As soon as the bones become eburnated, osteoclasis or osteotomy. 4. Osteoclasis is to be preferred in all classes of deformity near the middle of long bones, in a large proportion of cases of knock-knee and other deformities near the joints, and only rarely in bony ankylosis and club-foot.

W. Bolton Thomson,⁶ considers that operation will be found unnecessary in many cases if due attention be paid to hygiene, massage, and the use of plaster-of-Paris splints. Treatment

BEELY'S APPARATUS TO EQUALIZE THE LENGTH OF LIMBS.
(*Illustrirte Monatschrift für ärztlichen Polytechnik.*)

should be directed toward removing the rickety condition of the child, which is the real cause of the deformity. Hartwig, of New York,⁵⁹ suggests that an attempt might be made to stimulate the growth of the inner condyle by introducing a disinfected ivory nail, on the principle that irritation causes reaction, and if irritation could be induced in a thoroughly antiseptic manner it might cause the condyle to grow to proper size. This expedient has not yet been tried, but as it is much less formidable than the other operations it seems worth testing.

For extensive shortening of the lower extremity, F. Beely, of Berlin,⁷⁸⁸ has invented a very ingenious apparatus to equalize the length of the limbs, and which allows of extension of the ankle-joint in walking. As it is designed to support the whole weight of the body, the apparatus must not be constructed too light. It can be understood much better from the illustration than from a description.

Alfred Bidder, of Berlin,⁷⁸⁹ describes a simple apparatus for correcting genu valgum in children, which is easily constructed of tin, is durable and cheap. It consists of three trough-shaped pieces, two adapted to the outer side of the limb above and below the knee, which are connected by a bow of iron attached to each piece about its middle by a movable joint; a third curved piece is applied along the inner side of the limb opposite the knee-joint; the last piece is fastened by elastic straps going above and below the knee to the iron bow before mentioned. When this is applied it does not interfere with the growth of the limb or the movements of the foot, but flexion of the knee is impossible.

A brace for the same purpose, though more expensive, has been devised by Stillman.⁶¹ This depends for its efficacy upon a couple of metallic springs pressing upon the convexity of the curve. It has a desirable addition in ratchets below the ankle-joint, so that the foot may be inverted or everted in its relation to the leg if desired.

BIDDER'S APPARATUS FOR
GENU VALGUM.
(Deut. Med. Woch.)

A. S. Roberts,⁹ classifies bow-legs and knock-knees as due to one of three causes: (1) rachitis; (2) ligamentous relaxation; and (3) central disturbances, as poliomyelitis, etc. As to the bone changes resulting from rachitis, he divides them into three stages: (a) stage of vascularity, (b) of softening, (c) of sclerosis. In the last of these stages he considers mechanical treatment as useless, and resorts at once to osteotomy rather than to osteoclasis. He ascertains where sclerosis is present by the use of a bone drill. Where it encounters no obstacle in entering the bone he uses

mechanical treatment; but where, on reaching the bone, it meets with sudden resistance, as if being bored into ivory, he resorts to operation.

Jeannel, ⁶_{Apr. 21} of Toulouse, has practiced longitudinal osteotomy on several children with good results. He applies this term to an operation which consists in dividing bones curved by rachitism, with the object not only of straightening but of lengthening them. He succeeded in completely correcting very marked incurvations, and obtained a lengthening of more than one centimetre. Ollier, who had called particular attention to this operation, supported the conclusions of Jeannel, and observed that one has great difficulty in obtaining the lengthening of bones, and that longitudinal osteotomy is the only means by which it may be obtained.

DEFORMITIES OF HANDS.

Club-Hand.—T. Piéchaud, of Bordeaux, ⁷⁰_{Sept. 30} reports in a clinical lecture the case of an infant, three and a half months old, with a double clubbing of both hands and feet. The feet were in the condition of equino-varus; the hands had their palmar surfaces turned back upon the anterior face of the forearm, inclining inward on the ulnar side. The upper extremities appeared to terminate in a sort of a stump formed by the carpus and the ends of the radius and ulna, forming a typical illustration of congenital deformity of club-hand of the cubito-palmar form in the first degree. On account of the tender age of the patient, no apparatus was applied, but the mother was instructed each day, and several times a day, gently to bring the parts into their normal relations, to move the finger without violence, and also to practice massage. At the end of five months the child was entirely cured by the manipulations, which had been faithfully performed by the mother. M. J. Roberts, in a paper already mentioned, refers to a case in which knock-knee, club-foot, and club-hand coexisted in an infant.

Hypertrophied Digits.—A case of hypertrophy due to congenital malformation of the second and third toes of the foot (left) in a man, thirty years of age, has been reported by R. A. Stirling ²⁸⁵_{Apr. 15} to the Victoria Medical Society of Melbourne, and he exhibited the toes, which he had amputated. He also exhibited a specimen illustrating a somewhat similar condition affecting the middle finger of the left hand of a child.

ORTHOPÆDICS OF TARSAL JOINTS AND TOES.

In an article on "The Medio-Tarsal Joint from an Orthopædic Point of View," E. S. Stanmore Bishop⁸⁰ claims that a correct appreciation of the normal relations and functions of the tarsal joints is necessary for a proper understanding of the alterations which occur in disease and their appropriate treatment. Of the joints of the foot, he insists that two are of primary importance, "primary joints"—the tibio-fibulo-astragalar joint (the ankle-joint proper) and the medio-tarsal joint. All the others are of secondary importance and may be termed "secondary joints." Although this is referred to by Adams, Sayre, Barwell, and a few other writers on orthopædics, Bishop claims that the importance of this medio-tarsal joint is far from being properly appreciated by authors and teachers.

According to his view, the medio-tarsal joint is composed of but one joint. It is not an arthrodial or gliding joint, but a modification of an enarthrodial, or ball and socket. It does not pass entirely across the foot, but only partly. It is not a transverse joint, the axis of its greatest diameter being antero-posterior. In short, the calcaneo-cuboid joint has nothing whatever to do with it, being merely a "secondary" joint, distinct in every way from the "primary" medio-tarsal, except in the fact that it is *nearly* in the plane of part of it. It is not, however, confined to the articular surfaces of the astragalus and scaphoid, the scaphoid bone being only a bony plate developed in one part of the capsule, but includes also the anterior articular surfaces of the astragalus and calcaneum, the calcaneo-scaphoid ligaments, inferior, internal, and superior. It is a segment of a true ball-and-socket joint, partially modified by pressure, of which the talar head is the ball, and the rest of the tarsus, os calcis, scaphoid, cuboid, and cuneiform the socket, so far as the movements now considered are concerned.

Hammer-Toe.—This condition of contraction with deformity, usually affecting the second toe, has been the subject of several papers during the past year, without expressing much agreement, however, either with regard to etiology or to treatment. Badly fitting shoes are accused by some of causing this condition, while others see in it a neurosis, with a resemblance to the claw-hand of Duchenne's paralysis. While it is doubtless true that some infants are born with a decided tendency to this deformity, it is still possible

that it is due to the narrow-toed shoes of the parents. The entire absence of any such appearance as crossing toes and hammer-toes among the peoples of the East indicates strongly that the condition is produced by our foot-covering. Eugene Cohen¹¹⁶⁴₁₈₈₇ attributes hammer-toe to a vice of development, to rheumatism, and to local lesion. In the way of treatment, recommendations vary from doing nothing beyond ordering a proper-fitting shoe to amputation of the digit. W. Adams²_{v.1,p.466} practices subcutaneous division of the lateral ligaments, immediate extension, and keeping the toe in a metal splint for three or four weeks. In extreme cases he advises excising the head of the first phalanx, as practiced by W. Andersen.¹¹⁶⁵_{v.30,p.248}

Petersen, of Kiel,⁸_{Apr.11} has succeeded in relieving this condition by removing the soft and tendinous structures under the second toe, which are the seat of pain. Terrier,³_{July 25} reports successful resection of the ends of both the phalanges forming the affected joint, with the cutting pliers, through a longitudinal incision on the dorsum of the toe; he also removes the callosity and the bursa lying over its most prominent portion. In eight cases he has performed cuneiform osteotomy with perfect results. In children Trélat,³_{July 25} has found electricity, manipulation, and retentive apparatus sufficient to prevent the redevelopment of the deformity.

STATISTICS.

In a communication to the last French Congress of Surgeons Jules Boeckel¹⁶⁸_{May 1} presented the statistics of twenty cases of resection, all followed by successful results both as regards recovery of the patient and the cure of the deformity. They consisted of nine resections of the elbow, one of the femur below the trochanters, three of the knee, three tarsotomies, and four operations for pseudarthrosis.

ELECTRICITY IN BONE SURGERY.

Remarkable industry and ingenuity have been shown by Milton J. Roberts, of New York,¹⁰¹_{June} in devising and perfecting instruments for utilizing electricity in orthopædic and general surgery. As a source of power, in place of the ten-cell, zinc-carbon battery which he formerly employed, he now prefers to use a storage battery which can be charged from an incandescent lamp circuit. He finds that ten of the Messerole storage cells

(five by seven by one and one-half) connected up in simple series are sufficient to supply all the power required for the most formidable and prolonged bone operations. In case primary batteries are used to charge these ten cells, a main primary battery composed of from forty to forty-five cells (such as are used in telegraph service) would be necessary. The charging current must be down to one ampère or less, and the cells are to be charged at the rate of one ampère for six to ten hours more or less. By adding cutting instruments to a small electromotor, he has obtained what he terms an electro-osteotome, which in some cases has great advantages over the ordinary means of dividing bone. He has also similarly constructed a bone-drill and trephine. When operating, he employs what he terms a "Celioscope," which is a small incandescent Edison light, which can be introduced into the opening made by the drill, and thus permit of examining the field of operation directly. Among the various forms of instruments for measuring the extent of deformities are the sphenometer, the epipedometer, the protractor, and calipers, which reduce the problem apparently to one of mathematics. This appearance is emphasized by the publication of a number of trigonometrical tables embracing over twenty-two thousand individual calculations, which he has had constructed in order to facilitate the calculation of the exact dimensions of the wedge of bone that it would be necessary to remove in order to correct a given deformity, and which is appended to the paper read by Dr. Roberts before the International Medical Congress, at Washington. This appears like laborious and unnecessary refinement of diagnosis. The homely array of instruments that Gross used in his bone operations are not farther removed from the liberally supplied armamentarium of our author than Gross's prompt decision as to the shape of the wedge of bone that he desired to remove to correct a deformity from the instruments of precision and mathematics of Dr. Roberts. One would suppose that the one would have the operation done before the other had made ready to begin. It is but just to say, however, that in the treatment of ununited fracture the method advocated by Dr. Roberts is a decided advance over the usual operation. The small saw of the electro-osteotome allows him to section the bone *in situ*, merely covering the surrounding parts by his "protecting retractors,"

slipped under the bone, used singly or in pairs, according to circumstances. After the ends of the bone are freshened, he unites them with absorbable sutures, preferring those made from kangaroo-tendon for this purpose. The wound is then dressed antiseptically with hydronaphthol, and the limb secured in a gutta-percha fixation splint with the roller-bandage. T. G. M.

ORAL SURGERY.

By J. E. GARRETSON, M.D.,

ASSISTED BY

M. H. CRYER, M.D.,

PHILADELPHIA.

TUMORS OF THE JAW.

HEATH⁶ reports a case of sarcoma of upper jaw which affords considerable encouragement to the surgeon in the removal of sarcomatous growths in this location. Five operations were performed for the removal of a growth described as a myxosarcoma and for recurrences. The patient was under treatment for a period of nineteen months, and now, after four years, there has been no further evidence of the disease. Mr. Heath is, therefore, justified in regarding the patient as cured. It is comparatively seldom that such a satisfactory result can be recorded, rapid recurrence being rightly regarded a sign of great malignancy, the recurrent growths being usually softer, more vascular, and of deeper extent. Much depends, in these cases, on the assistance given by the patient himself, who, by recourse to operation in the earliest signs of return of the disease, may hope for ultimate cure.

Lloyd⁶ reports a very interesting case of an odontoma of the upper jaw, where it does not occur so frequently as in the lower jaw. The patient said that, long before, he had received a blow on the right side of the upper jaw. About six weeks since he had toothache in the right upper molars, and soon noticed that his face and right eyelid were swollen. Two or three days afterward an attempt was made to extract a tooth with the result that it was broken. About this time he first discovered the structure for the removal of which he came under care.

The view that these growths are due to "certain modifications which the molar teeth undergo during their development" is supported by a careful examination of this specimen. The mass occupied the space of the second, and probably third, right upper molars; it could be felt to be slightly loose before attempts were

(K-1)

made to remove it. After its extraction a deep, round, smooth, velvet-like cavity remained, and the exposed part, with its crater-like hollow and surrounding ridge, bore a certain resemblance to a molar tooth-crown. Suppuration has been present in several of the cases; this may be due to an effort of nature to throw off the dental mass, which has become too large to be properly nourished. These inflammatory changes Sutton considers are analogous to the ordinary eruption of normal teeth.

A case was operated on by the senior editor, where an osteodontoma occupied the left half of the lower jaw, extending from the mesial line far up into the neighborhood of the articulation. This tumor was of congenital origin. Tooth structures and bone were heterogeneously developed. The common mass was hard as ivory. Removal was effected by means of the surgical engine, several hours being required for the operation. The patient is a young and vigorous man, being in perfect health aside from this trouble. Relation of the tumor to the neighboring bone precluded any idea of enucleation. Leaving the periosteum afforded promise of proper bone to take the place of the mass removed.

Dr. Wyeth⁵³_{May 6} reports a case of removal of nearly all of the maxilla without an external incision. Removal of large and small portions of the superior maxilla, sometimes extending to the palate, the malar, or turbinated bones, is often accomplished at the Hospital of Oral Surgery without making an external incision. Scarcely a week passes without one or more of these cases. Since the surgical engine was adopted for the removal of diseased bones, these operations have become very much simplified.

Dr. Lewis¹⁰⁰_{May 12} reports the removal of part of the superior maxilla for an osteosarcoma. He wished to remove the entire bone, but the patient's father objected. Within three months the patient returned, when the entire bone was removed, with the exception of the orbital plate and part of the nasal process. The external incision for the operation was made in a line from the malar bone to the canine tooth.

Treon⁵³_{May 6} reports the removal of a fibrous tumor situated in the anterior portion of the zygomatic fossa, resting against the zygomatic surface of the superior maxilla and the orbital process of the malar bone, to which it appeared to be attached; the tumor had grown so as to push this process upward, causing the edge to

protrude; the incision for the operation was made from the outer canthus of the eye to the angle of the jaw. Portions of the maxillary, malar, sphenoid, and temple bones were destroyed by the pressure of the tumor, which extended into the middle ear. In the operation the internal maxillary artery was ruptured in such a manner as to prevent ligation, but the hæmorrhage was controlled by packing with sponges wet with Monsel's solution. It was afterward found impossible to remove the whole of the sponge, part of it having become entangled in the new growth of tissue.

Matas, of New Orleans,¹² reports a case of symmetrical necrosis of the alveolar and palatine processes of upper jaw, as follows:—

“On examination it was found that two molars, two incisors, and one canine, all that remained of his upper denture, were very movable; they could have been easily extracted. The empty alveoli of the missing teeth presented a peculiar appearance. These cavities were deep, grayish, and filled with a very fetid pus. No reparative action had taken place, the walls of the cavity remaining inert and lifeless and exposing the dead bone. The flat end of a probe was readily insinuated between the gum and the alveolar process, revealing the fact that the alveolar semi-arches and the palatine plates of the upper maxillæ were entirely necrotic.

“The diagnosis was syphilitic symmetrical necrosis of the alveolar and palatine processes of the upper maxillæ.

Operative treatment. As a preliminary, the gums and palatine mucous membranes were anæsthetized with a 4 per cent. solution of cocaine hydrochlorate injected interstitially. The remaining teeth were readily extracted. Then with a knife and periosteal elevator the mucous membrane was rapidly separated from the alveolar process and palate. The necrotic area was distinctly defined above by a line almost corresponding to the floor of the nares. The palatine mucous membrane was completely detached with its periosteum back to the palate maxillary suture, where the necrosis, which was entirely limited to the upper jaw, appeared to end. With the chisel and a few strokes of the mallet the large alveolo-palatine sequestrum was loosened from its attachments, so that with slight traction with bone-forceps the whole mass, which was shaped like a horse-shoe, came away, leaving the nasal cavity almost completely exposed, and communicating directly with the

mouth. Two flaps of mucous membrane were left hanging, one vertically from above; the other, long and tongue-shaped, flapped down loosely like a curtain from the palate. After using a detergent wash and staunching the slight oozing that had followed the extraction of the sequestrum, the palatine and gingival flaps of mucous membrane were readily brought together with silver sutures, and the ugly gap remaining after the removal of the sequestrum completely obliterated. The patient was immediately placed on a specific and tonic regimen, and a nasal antiseptic douche and mouth-wash ordered. In spite of this, considerable suppuration followed, some of the silver sutures gave way, but granulations sprang up luxuriantly, and in the course of three weeks the roof of the mouth, though much flattened, had completely cicatrized, and, outside of the loss of the palatine arch, had returned to almost its normal condition."

Briggs¹⁰⁰_{May 12} reported a case of an enormous osteochondroma of twenty-two years' growth. The visible portion, which protruded from the mouth, was fully six inches in diameter. The mouth itself had been stretched until all semblance to the original orifice was lost, and all that could be seen of what was once the chin was the upper surface of everted lower lip. On examination the tumor was found to be of rock-like hardness, irregularly round in shape, and occupying almost the entire cavity of the mouth, the only vacancy being a small space between the roof of the mouth and the top of the tumor. The tongue was doubled up and forced backward; the teeth, with the exception of two or three stumps, were gone—either absorbed or extracted. The incisions were those usual in removal of the lower jaw. The tumor was found to be irregularly pear-shaped, averaging seven and a half inches in diameter, and having a circumference at its largest part of about twenty-three inches.

Injuries of the Jaws.—Ratty¹⁰⁹_{Nov.} reports a case of a patient who had been bitten by a grizzly bear. The wound was not dressed until a week after its infliction. The brute had bitten through the fauces, the teeth going entirely through the superior maxillary. The inferior maxillary was snapped in two on both sides, at the angles. The trachea and jugular were exposed, and the chin rested on the chest and was held by a strip of tissue about an inch wide at the angle of the mouth on the right side.

The wounds were full of maggots and the edges gangrenous. The fragments of the left side of the inferior maxillary were found to be dead, but in order to retain the proper contour they were wired to the other portions of the jaw. The bare surfaces were covered by a flap taken from the cheek and neck. Three days after the operation, and ten days after the wounding, the patient was doing well.

EXCISION OF THE TONGUE.

A difference of opinion exists as to the best method of excision of the tongue; Barwell⁶_{Dec. 31, '87} reports three cases by the following method: "Strictly in and along the middle line an opening about one-third of an inch long is made immediately in front of the hyoid bone through the raphe of the mylohyoid. The geniohyoid and geniohyoglossus muscles are separated with the handle of the scalpel until the deep surface of the mucous membrane forming the floor of the mouth is reached by means of Liston's needles carried under this membrane to or even beyond the last molar teeth; threads are passed on each side into the buccal cavity, which in their turn draw flexible wire twist, first into, then out of, the mouth in such a way as to surround the base of the tongue as far back as one will. An *écraseur* working with these wires severs that part of the organ, then a loop of another *écraseur* is passed between the teeth, pressed well down on the first incisor, and divides the structures beneath the tongue."

Homans⁹⁹_{Apr. 12} reports the removal of a tongue, the disease of which embraced the left side, the floor of the mouth, one of the pillars of the soft palate, the stylohyoid, styloglossus, and the pterygoid fossa by the following operation: "An incision was made parallel with the jaw and over the ramus and symphysis of the jaw, then opening the mucous membrane after stopping the bleeding, and pulling the tongue through the artificial opening thus made; but the disease having involved the muscle, it would not come out, and I applied the *écraseur* as far back as I could. The first time I took off three-fourths of the tongue, and, having freed the floor of the mouth and the anterior muscles down to the hyoid bone with scissors, I then applied the *écraseur* again just in front of the epiglottis, so that the entire tongue was removed and the muscles of the floor of the mouth. Then with scissors I removed the pillar and the disease which had run up the styloid

process, but was unable to reach all the disease in the pterygoid fossa."

Whitehead,⁶ makes a lengthy report in favor of excision of the tongue by scissors, claiming that as by far the most satisfactory way of operating, losing less blood than by the *écraseur*, simple or galvanic. Out of ninety-one cases he can positively state that not one suffered from the quantity of blood lost. The advocates of removal by scissors claim the following advantages: (1) rapidity of removal; (2) the greatest precision in removing all the diseased parts. As regards the risk of septic infection Whitehead thinks the *écraseur* has the advantage. Whitehead advises that immediately after the operation the parts should be washed with a solution of perchloride of mercury, well dried, and painted with an antiseptic varnish composed of the ordinary ingredients of Friar's balsam, substituting a saturated solution of iodoform in ether or rectified spirits. This is much more comfortable to the patient than dressing with gauze or lint.

Jacobson,⁵ in a paper on "Cancer of the Tongue and the Chief Operations for its Removal," refers to its increasing frequency—more common in man than woman—its different stages, and the questions arising before operations. He divides the methods of removal into four—first, Whitehead's; second, Symes'; third, Kocher's; fourth, with *écraseurs*—and gives a full description of each with a decided preference to the first, with some modifications, the principal of which is preliminary laryngotomy. The first six cases were performed without laryngotomy, afterward sixteen cases with laryngotomy. He writes that with his wider experience he thinks very lightly of the preliminary step, though he is inclined to recommend it under the following circumstances:

1. When the surgeon is in doubt of controlling the hæmorrhage.
2. When the disease extends into the posterior third of the tongue.
3. When the floor of the mouth is involved.

We do not adopt the preliminary laryngotomy in the removal of any portion of the tongue or other operations within the mouth.

Wyeth,¹ gives the following method of controlling hæmorrhage during the operation of removing the tongue: An incision is made between the hyoid bone and the symphysis menti; a long Peaslee needle, threaded with strong silk cord, is passed through the incision and the floor of the mouth into the mouth between

the base of the tongue and the angle of the jaw, at which point the silk cord is caught with a pair of pliers, the needle withdrawn. The needle is then threaded with another piece of silk cord and again passed through the incision, entering the mouth on the opposite side of the tongue from where the first cord was caught by the pliers; this cord is also caught, the needle withdrawn, and the two cords made fast over the top of the base of the tongue in front of the epiglottis. Wyeth advocates the passing of a piece of wire through the apertures and with it replacing the silk cords, but the editors are of the opinion that the silk cords are sufficient and better than the wire. The two ends of the silk cords (or wire) at the external aperture are made fast to an *écra-seur*, which is then tightened up until the pressure is sufficient to control the hæmorrhage until the organ is removed and ligations are made.

Ohdedar²⁰⁶_{July} recommends the following method of feeding a patient where it is impossible to do so through the mouth. He first fills a syringe with the liquid food, then attaches a number eight male gum-elastic catheter; the catheter is then passed through the nose, the pharynx, and into the œsophagus, and the food gently forced by the syringe.

Shepherd²⁸²_{June} reports a case of excision of the tongue, followed by death from acute miliary tuberculosis. The patient, a strong, healthy Irishman, had never been ill, never had coughed, and had been but a moderate smoker.

Lydston²³¹_{Sept.} reports a case of diffused syphiloma of the tongue. The patient (twenty-nine years) contracted syphilis at eighteen. Secondary symptoms appeared in about four months, at which time he was placed under mercurial treatment and salivated twice. At this time (seven years after the above treatment) he had cerebral syphilis and tuberculous, squamous syphilides in considerable number about the forehead, forearms, and thighs, and a few scattered over the trunk. The tongue was rough, and coated with thick, dirty, yellowish-gray fur, with marked dryness in the centre and posterior part of the organ. Several tubercular nodules were also observable—one in the centre of the tongue and the others near its base, those upon the right side being especially marked. Successful excision by means of galvanocautery was performed.

Bleything¹_{June 23} reports a case of sarcoma of the tongue in

a patient aged seventeen. A growth of about the size of a pea, composed of granulations slightly elevated, was formed on the border near the tip of the tongue. An application of nitrate of silver was made May 6th, 1882. On the 8th the base of the ulcer was slightly increased and the treatment continued. May 11th, the granulations were removed by scissors and the parts burned with nitrate of silver, and again so burned May 15th. May 20th the granulation had become more luxuriant and of whitish hue. June 1st, made a microscopical examination of a section taken from the parts, showing the presence of round-celled sarcoma. June 29th, an operation was made as follows: A strong loop of silk was passed through and the tongue drawn forward. By the use of a strong pair of scissors the tongue was divided in the median line for an inch and a quarter; another cut was made at an angle of forty-five degrees, thus taking out a triangular piece containing the diseased parts. After ligating the bleeding vessels the edges were drawn together by silk sutures.

Symonds,² reports a case of epithelioma in the mouth, the removal of the tonsil, part of the soft palate and part of the pharynx and tongue, with subsequent resection of half of the lower jaw, in a patient aged forty-five. The patient was fed by a tube passed through the mouth. He was able in a few days to swallow fluids freely. At the end of the week he was walking in the park, all the wounds being healed except where the drainage tube was placed. On the fifteenth day, though looking feeble, he at his own desire returned to Portsmouth.

Cormalt⁵⁰_{Oct. 18} gave an interesting *résumé* of the present status of operations for the removal of the cancerous tongue. The infiltrations of the growth, difficulty of swallowing, the annoyance of dribbling of saliva, fetid breath, more or less frequent attacks of impending suffocation, the consciousness that there is no permanent relief, tends to make the patient's condition wretched, and should induce the surgeon to do all in his power to give temporary relief. The radical operation of extirpation is now the only accepted one in cancer of the tongue. Statistics of the Connecticut State Board of Health give one thousand two hundred and twenty-seven cases of death from cancer, in two hundred and thirty-one of which the site of the disease was unknown. In twelve of the remaining nine hundred and ninety-six it was located in the

tongue. In three the sex was not given; in one the disease occurred in a female; in eight in men. Probably the proportion of cancer of the tongue to all cancers is 1 per cent. The general rule in cancer exists in these cases, that it usually originates at a point of long-continued irritation. The irritation may be due to broken teeth, incrusts, hot pipe-stem, etc. An enumeration of statistics made by Mr. Barker shows the many and important difficulties which surgeons encounter in operating. Death after the operation comes from one of two causes: from hæmorrhage—primary or secondary—or from septic pneumonia. If the patient recovers from the operation, death will, of course, finally result from recurrence of the disease in surrounding tissue.

Hæmorrhage during the operation is almost entirely under the control of the operator. Skilled assistance is necessary during the operation. Cormalt would not undertake the operation with cocaine alone or an anæsthetic, although it had been done. If the artery is tied, it should preferably be done in the digastric triangle. He favors preliminary tracheotomy to administration of anæsthetic, to prevent blood entering the lungs, etc., and feeding the patient through a stomach-tube. He opposes removal of the diseased mass by ligation, *écraseur*, and galvanocautery. With the use of the cautery the slough is long in coming away, and exposes the patient to septic infection from decomposition. After referring to Whitehead's operation by the knife, he describes that of Kocher, of Zurich, which Dr. Cormalt adopted in one instance successfully; but the patient exposed himself six weeks later and contracted pneumonia, from which he died. He does not favor leaving half the tongue, as it is of little use, and one cannot say positively that it contains no cancerous infiltration.

NERVE EXSECTIONS OF THE FACE.

The operation for making an exsection of inferior maxillary nerve in the maxillary canal without a resulting scar on the face is thus performed by the senior editor: He commences by drawing, with ink or pencil, a line beneath the base of the jaw, which is not to be seen when the face is looked at. This line is drawn up until it is directly over the canal, when an incision is made through the soft parts, exposing the bone. Next, the lips of the wound are retracted and the periosteum scraped from a limited line of the jaw.

In a succeeding step he uses the bur of a surgical engine for the removal of the roof of the canal, thus laying back the nerve to any desired extent. The nerve being removed by means of knife or scissors, the parts are thoroughly washed and disinfected. A final step consists of closure of the lips of the wound and aiming at securing union by first intention.

In making exsections of nerves great attention is to be given to the securing of a clean cut. Where a neuralgic condition is the occasion of an operation, a division by fraying or tearing is almost certain to have non-cure of the condition related with it.

Neurotomy, or simple division of a nerve, is objected to as being followed by almost immediate reunion. Resection, or neu-rectomy, is the indication in the operative treatment of neuralgia.

Mechanical Cause of Facial Neuralgia.—Dr. John S. Marshall called attention to another cause of persistent neuralgia of the face and temporo-maxillary articulations, namely, the irritation produced by the malposition of parts resulting from extended operations upon the inferior maxilla, which require exsection of large portions of the bone, and in which subperiosteal operations are not admissible, as, for instance, in the removal of malignant growths, and in gunshot injuries where large portions are carried away. In the following case a deformity of the right lower maxilla and right side of the face existed, accompanied by severe neuralgic pains in both temporo-maxillary articulations and in the right brachial plexus.

Miss Ada S., aged forty-two years, American; occupation, seamstress; had been operated upon eight years before for the removal of an osteosarcoma of the right inferior maxilla. The entire bone was removed from the right first bicuspid, back to and including the angle, and about half an inch of the ramus. Extensive suppuration followed the operation, and the wound did not heal for several months, leaving an ugly cicatrix about an inch in width at the base and four inches in length, and a malposition of the jaw, which was considerably displaced, the right ramus being brought forward and the jaw carried backward and to the right, so that the median line of the chin was fully half an inch to the right of the median line of the face. Fibrous union had taken place between the ends of the bone, but was so flexible as to afford but little support. The distance between the ends of the bone was about one-fourth of an inch.

Motion of the jaws produced spasmodic pain in the temporo-maxillary articulations and in the right shoulder and arm. Movement of the arm, as in sweeping or using a pen or needle, brought on the spasmodic pains in the arm and shoulder. Walking, riding, or any motion which jarred the body also excited the paroxysms. Whenever the body could be kept at rest she was free from pain. The mouth could be opened only three-fourths of an inch, due to the malposition of the jaw. The teeth were free from caries, but were all more or less affected with pyorrhœa alveolaris. The teeth of the upper jaw had all been lost for several years and the patient wore a full upper artificial denture.

All the usual remedies for neuralgia had been tried under the supervision of noted practitioners, but no relief had been afforded.

“After several careful examinations,” says Marshall, “I came to the conclusion that the neuralgic pains in the articulations were the result of the contraction of the cicatricial tissue and the displacement of the jaw, and, in all probability, the pain in the right brachial plexus was purely a reflex neurosis dependent upon the same cause.” Correction of the deformity, secured through operations which employed mechanical means, together with graftings of sponge and rabbit-bone, resulted in complete cure.

The sponge remained until May 7th, when suppuration took place and it was removed. Up to the time of the removal of the sponge there had been no return of the pain after the operation, but the following day the pains returned, though less severe than before, in the articulations, but not in the arm.

This proved the diagnosis to be correct and encouraged the belief that if the jaw could be permanently held in its normal position a cure could be effected.

Excision of the Three Divisions of the Trigeminal at One Sitting.—Bernays, of St. Louis,¹⁰¹ reports the excision of the three divisions of the trigeminal nerve at one sitting for a patient suffering from tic-douloureux of twenty-six years' standing. The first division was excised as follows: An incision of an inch and a quarter was made parallel to and just below the eyebrow down to the supraorbital ridge, at which point the nerve was grasped in an arterial forceps. Tension being made upon the nerve, it was traced back as far as possible and cut off, the nerve being drawn through the supraorbital foramen, the branches followed some distance, and

cut off. Langenbeck's operation was used in the resection of the superior maxillary nerve, which consists of a vertical incision over the infraorbital foramen, the nerve being dissected out and grasped by an arterial forceps. Next, a long, narrow-bladed scalpel, slightly curved near its end, is inserted through the skin just below the external canthus for a distance of about an inch and a half into the orbit, keeping the point of the knife close to the external wall until it enters the speno-maxillary fossa. By making tension with the forceps the nerve can be felt with the point of the knife, when it is cut, after which the nerve is drawn out of the interorbital canal by the forceps. The resection of the third division was performed as follows: The nerve was dissected out at the mental foramen and grasped by the arterial forceps; a dental chisel (one-quarter inch) was directed across the alveolar process at a point corresponding with the last molar tooth and driven into the bone through the canal, cutting the nerve, which was drawn out through the mental foramen by the aid of the forceps.

AFFECTIONS OF THE SALIVARY GLANDS AND THEIR DUCTS.

Laceration of Steno's Duct.—Sinné⁹_{July 14} reports a case of laceration of Steno's duct, followed by inactivity of the corresponding parotid gland. As there is at present not a sign of either fistula or abscess—complications which were anticipated—Sinné concluded that the parotid gland, owing to the continued pressure, became hermetically sealed by the union of the flap to the underlying part and ceased activity, in time probably undergoing atrophy because of non-use. The patient does not complain of pain or other ailment, and is, to all appearances, perfectly well. The case in question certainly compels us to conclude that it is best to postpone surgical interference in all similar cases.

Abscess and Fistula Caused by the Passage of a Hair into Steno's Duct.—Overall⁵⁹_{May 12} reports a case of the passage of a hair into Steno's duct, causing an external abscess and fistula.

After an unsuccessful operation to extract the hair had been performed it came out of its own accord in a week, ending the trouble but leaving a considerable scar.

Multiple Salivary Calculi.—Moïseëff⁹⁹_{Apr. 12} reports a case of multiple salivary calculi in a patient, aged seventy, who sought his advice on account of incessant profuse salivation, pain on deglu-

tition, and sublingual swelling of several years' standing. The total weight of the dried calculi was thirty-eight grains. The wound healed well in a week. Moïsëëff has been unable to find another recorded instance of multiple calculi simultaneously present in the same salivary duct.

Treatment of Ranula.—Verchère,¹¹ treats ranula by puncturing the tumor with a Pravaz syringe. A solution of cocaine 10 per cent. is then injected, and four minutes afterward, when the anæsthesia is complete, twelve drops of a solution of chloride of zinc (one-tenth) are introduced. The needle is then drawn out, and for two or three days the patient speaks as little as possible, and avoids food requiring prolonged and active mastication. Four patients suffering from sublingual ranula were cured by this treatment, which is not too painful.

Congenital Ranula from an Imperforate Wharton's Duct.—Guinard,¹¹ believes that this variety of ranula is rarer than is commonly supposed; he has made bibliographical researches, and has only been able to find nine well-authenticated cases in medical literature: Two in Riches' thesis (1882); two in Remignon's thesis (1885); one case of Demons' (*Bull. Soc. Chir.*, tome vi); two cases of Lannelongue, *ibid.*; one case of Guyon, and, finally, one recent case of Verneuil's.

A Ranula Due to an Unusual Cause.—W. F. French,⁵⁹ reports a case of ranula caused by the pressure of a piece of a hard apple against the floor of the buccal cavity. A lump was formed which broke twice during the week, discharged its contents, and then promptly filled again. On inspection there was found a tense, semi-transparent, cystic tumor, irregular in shape, about the size of a large walnut, below and to the right of the frænum linguæ, close to the point of exit of Wharton's duct, and the surface had small blood-vessels branching in all directions. The tongue was crowded to one side, and could not be protruded beyond the teeth.

COCAINE IN ORAL SURGERY.

Hugen Schmidt,¹⁹ in a communication upon the use of cocaine, records the use of the muriate of cocaine hypodermically for local anæsthesia in cases of minor surgery, including the removal of portions of bone from the alveolar processes, and other operations about the jaws. Out of four hundred cases, he had

five in which severe symptoms were produced, due, doubtless, to the physiological action of the drug. He prepares the solution for the syringe by taking twenty minims of distilled water to one grain of the salt, and injecting ten minims of the solution. Even this amount upon certain persons produced severe symptoms.

ABSCESS, CARBUNCLE, GLANDERS, AND KINDRED DISORDERS.

BY J. WILLIAM WHITE, M.D.,
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ABSCESS.

Microbism and Abscess.—Verneuil ¹⁵²_{p.1399} comes to the conclusion that: 1. Pus is not exclusively characterized from the anatomical point of view by the globules; for there are also elements of special shape which can be reproduced at will and multiplied, as in the living tissues of animals, and which appertain to the microbian kingdom. 2. These microbes are, if not constant, at least so frequent that they seem inseparable from pyogenesis, and constitute the unique and true cause, when introduced into the organism, of suppuration and abscess. 3. Pus is monomicrobic, or polymicrobic, as it contains one or more different species of microbe. In the first case there can be no doubt as to the pyogenic property of the microbe present; but in the latter it is not easy to tell which one is the cause of the suppuration. 4. In solving this problem it is well to divide the microbes observed into two categories: those so generally found in suppuration that they may be considered normal and necessary, such as micrococci and diplococci diversely grouped and colored; streptococci, zooglœa, staphylococci, orange, lemon, white, etc. In the second, micrococci, bacteria, vibrios, bacilli, etc., exist in pus accidentally and irregularly. He divides abscesses into simple and infected, as they are due to the pyogenic microbes, or to these and the accidental microbes together.

Roswell Park ⁹_{vol.6} reports a peculiar abscess arising from a carious tooth, occupying the left side of the face and neck, extremely sluggish in its character and without very marked constitutional symptoms. It was finally evacuated and the tooth extracted. Portions of the pus showed that in addition to the two common forms of staphylococcus, it had contained the unusual micrococcus tetragenous. Park thought that this had not been previously found to be pathogenic in man, although it is known

(L-1)

that mice or other small animals inoculated with it experimentally may die in two or three days. It is stated that these organisms are occasionally found in human saliva and in sputum. According to Koch, these germs are also found in tuberculous cavities, forming groups often surrounded with capsules. When an animal is inoculated with this, it dies in three or four days with symptoms of septicaemia or pyaemia, or metastatic abscess in the spleen and kidneys. Large masses of the microbes are found, especially in the vessels, and in the pulp of the spleen. Cornil has also found this germ in a syphilitic abscess and in several metastatic abscesses in the same case. Its relation to the clinical peculiarities of Park's cases as well as to the others above mentioned is as yet undetermined.

Multiple Abscess in Children.—Henoch,²_{Apr. 1} has shown that suppuration of the connective tissues is especially marked during the first years of infancy. He refers to the multiple abscesses which appear simultaneously and successively in many parts of the body without appreciable cause. The younger the child the more frequent the abscesses. He believes that there must be a distinct suppurative diathesis. Bouchut attributes this frequent suppuration of the subcutaneous tissue to three diatheses: (1) the puerperal, (2) strumous, and (3) syphilitic. Roulland,⁴⁸_{Jan.} observes that Henoch and Bouchut alone have considered the question in a scientific manner. He concludes that subcutaneous multiple abscesses are seen in sucklings, and appear to be traceable to several causes. Hereditary taints, syphilis and scrofula especially, are decided sources of the affection. There remains a more important and essential form, Bouchut's puerperal diathesis. True infection from without may follow the ingestion of milk from a mother stricken with puerperal fever, or may result from erysipelas or suppuration of the stump of the cord. Roulland also quotes the important researches of Escherich,⁶⁷⁹_{No. 2, 37} who declares that in all children at the breast, whether they be well or ill, the staphylococcus albus and the staphylococcus aureus are constantly to be found in the liver and in the more superficial layers of the epidermis. These pyogenic germs may enter the sebaceous and sudoriparous glands and set up inflammation. Of course, they more usually enter through a breach of the surface, which is so common in the tender integuments of an infant.

O. D. Pomeroy¹_{Oct. 3} reported a case treated by him for suppurative otitis media followed, after some months, by an iritis, and later by suppuration in the anterior chamber, necessitating enucleation of the eye, and still later by an abscess of the side of the neck beneath the lobe of the ear. This was opened, dead bone being found by a probe passed into the meatus.

Pulsatile Abscess of the Pericardium.—The purulent collections which occur in the pericardial region, and which present the phenomenon of pulsation, have as an essential anatomical condition a retroperietal pouch communicating with the subcutaneous collection more or less directly. This patch may be of either primary or secondary formation. In the former case the abscess originates in the mediastinum from various causes, and makes its way to the exterior; in the second case it originates frequently from disease of the ribs, occasionally from traumatism, and finds its way backward. In either event, it is probable that the wall of the abscess is at some point in contact with the ventricular pericardium. Such abscesses are sometimes mistaken for cardiac aneurisms, which, however, never perforate the thoracic walls. Richet²¹⁷_{May 28} had the following interesting case: A male, forty-nine years of age, had had pericardial pain for eighteen months, and a swelling in the same region for two months and a half. It was situated two fingers' breadth below the nipple and three fingers' breadth above the false ribs, extending from the middle sternal line to near the axillary line. It had marked pulsation synchronous with the pulse. There was no bruit, and no alteration of heart-sounds. The tumor was opened by thermocautery and a large quantity of pus evacuated, and a perforation was discovered at the point of junction of the sixth rib with the intercostal cartilage. No denuded bone was discovered. The patient had an alarming syncope at the moment of evacuation of the pus, but recovered, and subsequently was entirely cured.

Subhyoid Phlegmon.—Mollière¹⁴_{Oct. 3} describes an evacuation characterized by great pain, dysphagia, dysphonia and dyspnoea, moderate fever, and hard, cedematous, comma-like swelling beneath the hyoid bone, great prostration, dry tongue, and a very rapid and unfavorable course. He believes death to be inevitable in a case of this kind, unless a most active antiseptic treatment is adopted. He recommends free incision of the organ under pres-

sure with strong antiseptic fluids, disinfection with iodoform, and drainage extending into all the recesses of the suppurating cavity. By this means he has saved several other cases which have come under his care. He describes a multiplicity of pathogenic microbes as associated with the disease, and mentions particularly the vibriola of putrefaction.

Treatment of Abscess.—Leroy W. Hubbard¹_{Oct. 13} reports a series of cases of acute abscesses treated by early evacuation, irrigation with bichloride (one to two thousand), and by antiseptic dressings with pressure. He believes that this plan, if generally adopted, will result in the majority of cases in almost certain cure in from forty-eight to seventy-two hours. Hameau,¹⁴⁰_{Aug. 10 to Sept. 7} in an elaborate paper, considers the treatment of abscesses by injections of ethereal solutions of iodoform. He concludes that the facts justify the conclusion that iodoform exercises a specific anti-tuberculous action and that its use in abscesses not only hastens their cure but prevents their return. A moderate-sized trocar is used and is inserted obliquely, so that the opening shall be valvular. The evacuation is made slowly and without pressure, and if the cannula becomes obstructed it is cleared by the insertion of a small wire; the vacuum in the aspirator is not made until the cannula is in place, and is then produced very slowly so as to prevent a sudden evacuation of the pus. By attention to these points hæmorrhage into the cavity of the abscess can generally be avoided. After evacuation the ethereal solution is injected, more than four scruples (five grammes) of iodoform being regarded as dangerous. After this the cannula is removed and the wound closed antiseptically. The cases of consecutive inflammation which have been reported by Lannelongue and others he believes to have been due to over-distention of the abscess-cavity. The avoidance of hæmorrhage is of value not only in its relation to the healing of the abscess, but by lessening the risk of general tubercular infection, no absorbent vessels being opened. In addition the patient is not confined to bed; the diffusible antiseptic liquid is more likely to reach every recess of the abscess-cavity than a knife or curette in the hands of the surgeon; the danger of rapid hectic is greatly lessened.

William C. Wile⁶¹_{Jan. 21} evacuates pus by means of a small aspirating needle, after which he injects with moderate force, by means of an Allen surgical pump, a twenty-volume solution of peroxide

of hydrogen mixed with an equal volume of water. This is repeated several times. A solution of chloride (one to two thousand five hundred) is similarly injected and withdrawn, after which iodoform gauze and a firm antiseptic bandage are used. He reports one hundred cases, with no accidents and rapid cure.

Holstein, in a recent Paris thesis,^{336, 9}_{No. 4; Mar. 17} reports that in Verneuil's clinic in Paris tuberculous abscesses have been treated for two years with iodoform dissolved in ether, with excellent results. Of twenty cases eleven were cured, six improved, and three unimproved by this treatment. After aspirating the contents of the abscess, from two and a half to twelve and a half drachms (9.72 to 48.6 grammes) of a 10 per cent. solution were injected at once. In large abscesses as much as twenty-five drachms (97.2 grammes) of a five per cent. solution were injected (?). If the ether proved irritating it was injected through a hypodermic syringe. This method is especially useful where it is desired to avoid a scar.

CARBUNCLE AND FURUNCLE.

Verneuil, in a communication to the French Academy of Medicine,³⁴⁵_{Feb.} reported a number of observations on the treatment for furuncle and anthrax, arriving at the following conclusions: 1. Furuncle and anthrax are only different degrees of the same infectious disease, and are amenable to the same therapeutical methods. 2. These latter include surgical interference and topical applications. The former has seemed to be indispensable, or, at least, applicable to the majority of cases. The latter, while thought to be more or less efficacious in mild cases, were considered as altogether secondary and subordinate to the operative treatment. 3. These conditions are reversed to-day; surgical operative intervention has become less and less necessary and should be reserved for very exceptional cases. On the contrary, topical treatment by antiseptics, especially carbolated or borated solutions employed in the form of spray, frequently and for long periods, have been shown to be at once markedly beneficial, absolutely safe, and easily managed. This treatment, with few exceptions, causes a rapid disappearance of furuncles or small carbuncles; it stops the progress of the disease in grave cases; it relieves the pain, fever, and general complications, thoroughly disinfects the purulent and gangrenous recesses, and favors the formation of healthy granula-

tions. 5. It is applicable in all regions, to all varieties, and at all periods of the disease. It is never poisonous and will of itself bring about a cure in the great majority of cases. It will also prove of great help in those cases where operative interference is thought to be absolutely necessary. 6. It tends to prevent internal auto-inoculation and general infection.

Loewenberg⁸⁵ believes he has established two methods of migration of the microbes arising from the furuncle or from a carbuncle. 1. The most common method, which is of daily observation, is seen in the multiplication of boils by the transportation of the microbes upon the skin and their penetration into new sebaceous follicles. In the same manner furuncles may be transmitted from person to person and are thus truly contagious. 2. In the second method of migration the microbes penetrate into the general vascular current and invade the different viscera, often producing fatal complications.

After an examination into the nature and treatment of furuncles, Leclerc²⁰⁸ comes to the following conclusions: 1. *Furunculosis is a parasitic disease.* It belongs to a group which includes certain forms of impetigo, sycosis, anthrax, osteomyelitis, styes, etc. Formerly considered as purely local, these affections, from a bacterial point of view, all depend upon the presence of the same microbes, whose virulence varies according to conditions which are as yet not well understood. Verneuil has recorded a case in which a patient thirty-two years of age had three styes, a month later a furuncle of the upper lip, within two weeks a carbuncle of the cheek, and still two weeks later a large abscess of the left flank. Bronard, of Poitiers,²²⁵ has recorded a case establishing the relation between furuncle and osteomyelitis. A woman, sixty years of age, in August, 1886, had boils on the right buttock; in September a suppurating episcleritis; later an abscess in Scarpa's triangle on the right side, another beneath the pectoralis major; in October she developed an abscess in the left thigh, which was followed some months afterward by a discharge of several sequestra and by general enlargement of the bone.

2. *Furuncle is an epidemic disease.* Various facts which tend to prove this are quoted by Leclerc.

3. *Furuncle is, as Loewenberg has claimed, a contagious disease.* Hergott has reported a series of cases of infection by a

dirty basin. Other cases have been reported by Trastour, Kischner, and others, and Leclerc adds one which occurred in his own experience.

The mycotic nature of furuncle and carbuncle is now the universal teaching. Nothing new has been added to the etiology or pathology of the affection.

Treatment.—In so far as treatment is concerned, Fenn,⁶¹ June 16, commends the injection of a five per cent. solution of potassium permanganate. Montagnon,²²⁸ Feb. 15, uses a four per cent. boric lotion applied externally and dresses the swelling with boric salve, giving tonics and stimulants internally. Edmund Owen,² Mar. 24, recommends the treatment of carbuncle by erosion and reports a case in which this treatment, followed by antiseptic washing, resulted in the disappearance of symptoms of septicæmia with a rapid cure. Herbert Page,² Mar. 24, reports three cases of the same sort, treated in the same manner, and always resulting in a speedy cure. He refers to the teaching of Teale, of Leeds, who advocated this method in January, 1887, and contrasts unfavorably the teachings of Sir James Paget, who recommends poulticing, suppurative treatment, and non-interference. Rushton Parker,² Mar. 24, concurs in recommending timely extirpation of the carbuncle as the most certain means of diminishing fatality in the most serious cases and of lessening the discomforts of the slighter cases. He reports five cases treated successfully in this manner.

Bouchard,¹⁷ Jan. 21, reports good results in general furunculosis from

R Naphthol,
Bismuthi salicylat.,
Magnesiæ, āā gr. 5 (0.32 gramme).

Repeated four times daily.

Gingeot,³⁵ Apr. 26, considers carefully the treatment of furuncle and of anthrax, and quotes Trélat to the effect that the 2 per cent. carbolic solutions of Verneuil are too feeble to produce the result expected of them; his objections to the method are (1) the need of a spray or atomizer; (2) the difficulty in avoiding wetting the bed and clothing of the patient; (3) the great amount of time which the application of the treatment requires. He believes in the practical superiority of applications of iodine over other topical methods of treatment, including the carbolic spray, the results being equally good, no apparatus being required, the duration of

each application being at most only a few minutes, and the patient escaping all danger of chilling from exposure or from contact with the spray.

ANTHRAX.

Pawlowsky⁵⁴_{Feb. 1} calls attention to the antagonistic action existing between the erysipelas coccus and the anthrax bacillus. It is only when anthrax manifests itself as a local disease that the erysipelas coccus can displace it. Both local and general anthrax are antagonized by the bacillus of pneumonia and the staphylococcus aureus. Bacillus prodigiosus also affords protection against local forms of anthrax. Emmerich finds that inoculation of erysipelas coccus, either before or after the inoculation of bacillus anthracis, will prevent the development of the latter disease. Mattei⁶⁷_{Nov. 18} proves that this immunity lasts only so long as the erysipelas cocci remain in the body, and that after from ten to fourteen days the susceptibility to anthrax poisoning is as great as before. A too powerful injection of erysipelas cocci may cause death as certainly as would the anthrax poison.

Zagari⁵³⁷_{No. 8, '87} claims to have demonstrated experimentally that the previous culture of other microbes, as, for example, of the cholera sporules or bacillus of anthrax, may be weakened so that it may subsequently be inoculated in the lower animals with safety, conferring upon them an immunity from anthrax poisons.

Buchner¹⁰⁷_{Oct. 18} demonstrates that inhalation of anthrax sporules by guinea-pigs and mice is rapidly and almost certainly fatal. Of the animals fed with food containing the sporules, comparatively few succumbed to the disease. Brown and Crookshank⁶_{Aug. 18} show that not only are swine susceptible to anthrax poisoning, but they can communicate it as readily as can the sheep or ox. Crookshank suggests that the bacilli here gain entrance through the tonsils, as the latter are found to be necrotic at the autopsy, and the cervical glands are always enormously swollen.

Karg⁵⁴_{Mar. 6, '88} examined microscopically and bacteriologically a fatal case of local anthrax. By no method could the bacilli be demonstrated before death, either in the blood of the patient or in the discharges from his ulcer. At the autopsy the liver, spleen, and intestines exhibited typical lesions. Only after repeated examinations of sections made from the prepared ulcer were a few collections of anthrax bacilli found, placed at the periphery of the

sore, and encapsulated in an abundant small, round-celled infiltrate. Sections of the lung showed very few bacilli; in the spleen, however, they were readily found. In all cases they were inclosed in cells.

Lodge²_{Aug. 28} reports seven cases of anthrax, five of which were rapidly fatal. Since Jarnovsky reported his seventy-two cases of anthrax, all successfully treated by injections of carbolic acid, and Scheffer and Stritzover recorded results equally favorable, there has been no more successful treatment advanced by the profession.

A case of facial anthrax,²⁵_{July 20} greatly indurated, with extensive œdema, and all the symptoms of grave general infection, was injected, in the fourth day of the disease, in four places about the pustule with a 2 per cent. solution of carbolic acid. This treatment was repeated twice on the first day, and once daily for three days. Compresses soaked in 5 per cent. carbolic solution were kept constantly applied to the part. Improvement was rapid, and the patient recovered with a scarcely perceptible scar. Contento⁵⁰⁵_{No. 29, 30} treated successfully six serious cases in a similar manner. He used a 3 per cent. carbolic solution, and made multiple peripheral injections. Lominesky⁵⁸⁶_{No. 3} adopted the same treatment in three severe cases of facial anthrax, and with a similar result.

Camera⁴⁹⁷_{No. 7, 37} reports a case of malignant pustule and of anthrax cured by cruciform incision, by the employment of radiating incisions around a large diseased area, the wound being dressed, when the bleeding had stopped, with powdered sublimate, and then with antiseptic wool.

GLANDERS.

Lubarsch,⁵⁴_{Ed. 6} following the experiments of Metschnikoff, demonstrates that anthrax bacilli, placed in the lymph-spaces of frogs, are taken up by the cells (phagocytes) and destroyed. The process of destruction is preceded by loss of virulence on the part of the bacilli. These attenuated bacilli, if injected into an animal susceptible to anthrax growth, protest not at all against the entrance and multiplication of the vigorous bacilli. The entrance of bacilli into the cells seems due to the activity of the cells rather than to aggression on the part of the micro-organisms.

Babès⁶_{Aug. 25} states that the bacilli of glanders can gain access to the body through the unbroken skin, penetrating the hair-follicles, traversing the epithelial cells, and producing the induration which

characterizes the papules of the incipient disorder. Kiemann⁸_{Sept. 2} reports in minute detail a most interesting case of acute glanders. Only after careful and repeated questioning was the fact elicited that the patient had slept upon a blanket belonging to a diseased horse. The patient entered the hospital complaining of pain and swelling of the left ankle. The temperature was 103° F. (39.46 C.). In a few days the knee-joint became involved, and the temperature ran up to 108° F. (42.22 C.). Subsequently finely nodular inflammatory indurations appeared at various points upon the surface of the body; these, breaking down, discharged a slimy, unhealthy pus. The spleen was enlarged, but there was no apparent involvement of either the nasal mucous membrane or the alimentary canal. Examination of the discharges from the ulcers and of the patient's blood showed the bacilli of glanders. The patient perished from exhaustion in about one month.

A case of perforating ulcer of the hard palate,²_{Jan. 18} with foul discharge from the nose and ear and gumma-like indurations appearing in various parts of the body, was treated for some time as syphilis, till, after several months, the characteristic farcy buds containing the glanders bacilli made their appearance. Death occurred from exhaustion. Another case of chronic glanders is reported,²_{July 28} in which the patient's body was covered with hard swellings. After a period of illness characterized by fever, prostration, diarrhoea, and bloody passages, he died from exhaustion, none of the surface lesions having ulcerated.

Proust⁴⁴³_{Jan. 20} records the case of a coachman into whose system the glanders bacilli gained entrance by means of a wound of the finger. Multiple abscesses appeared in all parts of the body. Not till a few days before death was there a moderate discharge from the nose and increased salivary secretion. The patient died from exhaustion in six months.

RAG-PICKERS' DISEASE.

This affection, classed as a form of malignant oedema, has been elaborately investigated by Paltauf.⁸_{Aug. 2 to Sept. 27} The disease appears among those employed in paper factories and is little known elsewhere. It is characterized by a chill, which is generally more severe than that which precedes a pneumonic attack, weakness, headache, sense of weight in the stomach, vomiting, and fever, the temperature rising to 39° or 40° C. (102.2° or 104° F.).

There is dyspnœa, steadily increasing syanosis, weak pulse, and in some cases subnormal temperature, 36° C. (96.8° F.), cold extremities, cold sweat and death, the mind remaining clear to the end; objectively slight râles and friction sounds can be heard, particularly on the left side, followed shortly by moderate dullness on percussion over the lower part of the lungs, and rusty expectoration. There is marked tenderness over the stomach and spleen. These are, of course, the symptoms and signs of a pleuropneumonia of typhoid type. Decomposition sets in very shortly after death; on examination a serous effusion is found in the pleural cavities, the lungs are infiltrated in places, the bronchial glands are swollen, the liver is markedly congested, and the spleen is two or three times its normal size. Klebs, in 1870, found bacteria similar to those of anthrax. Schlemmer found quantities of rod-shaped and spherical bacteria. Inoculations with the pleural exudate were made upon dogs and rabbits. Symptoms such as those described in man shortly developed, together with great local œdema and emphysema. Injections of the fluid in which rags were macerated produced like results. Schlemmer considers this disease more akin to malignant œdema than to anthrax. Krannhals⁵⁸_{B.L.3,H.2,W} also regards these bacilli as closely resembling those of malignant œdema. In a case of death from this disease, after three days' illness, an autopsy was made twenty-seven hours post-mortem. Microscopical examination showed quantities of thread-like bacilli both in the pleural exudate and in the cerebral fluid. From this Kundrat diagnosed anthrax, the lungs being the point of entrance. This diagnosis was fully sustained by inoculation of the exudate and pure cultures upon mice, guinea-pigs, rabbits, and lambs. Microscopical sections from another case demonstrated the presence of anthrax bacilli. This patient was in the fifth month of pregnancy; examination of the foetus showed that it, too, contained bacilli.

Rag-pickers' disease is identical in all points with wool-sorters' disease; the local form of the affection, or malignant pustule, has not, however, been observed in the former. To establish the possibility of infection through healthy lung, scraped-potato cultures and solutions of the same were introduced, by means of a catheter, into the lungs of animals susceptible to the anthracosis. The animals developed the disease, as did those which Buchner³²⁴_{B.L.3}

caused to breathe an atmosphere containing anthrax spores and powdered charcoal.

Finally, microscopical sections and bacteriological examinations conclusively prove that the so-called "rag-pickers' disease" is, in reality, due to the anthrax bacillus, which enters the system through the lungs. In some instances the trachea, bronchi, and œsophagus entirely escape involvement. Eppinger⁸⁴_{Sept. 15} confirms these conclusions. Bacteriological examinations were made in eight cases dead from rag-pickers' disease, in each case anthrax bacilli being found.

SURGICAL TUBERCULOSIS.

Arthur J. Barker²_{June 9, 18, 23} reviews the whole subject of tubercular joint disease and its treatment by operation, and admirably explains and justifies the present tendencies of surgeons everywhere to substitute early arthroctomy for later complete excision. He dwells upon the vastly inferior results obtained by treating for extensive destruction of the joint surfaces and for evidences of suppuration as justification for operative interference. The general ill-effects as suppuration upon the *ultimate* results of tubercular joint disease cannot be better illustrated than by an allusion to Willemer's tables, in which the knee is specially referred to. In these the results are recorded after the lapse of several years, the shortest time being two and a half, the longest nine, years since the reception of the patients into hospital :—

Knee Tubercle (Willimer).				
Non-suppurating,	.	.	.	68
Suppurating,	.	.	.	102
Resected,	.	.	51.0 per cent.,	against 60.0 per cent.
Amputated primarily,	.	0.0	"	16.0
Treated conservatively,	.	49.0	"	24.0

Of the last group treated conservatively there were, after a lapse of years :—

Complete cures,	.	.	54.0 per cent.,	against 34.0 per cent.
Incomplete cures,	.	18.0	"	19.0
Ultimate cure by amputation,	6.0	"	"	13.0
Deaths,	.	22.0	"	34.0

More than half of the total mortality after resections for tubercular disease is due to extension of the tubercular process, either locally or generally. Sack has analyzed one hundred and forty-four excisions of the knee with twenty-five deaths. In thirteen of

these the cause was tuberculosis. Of Mr. Croft's list of forty-five excisions of the hip with eighteen deaths, at least six were due to tuberculosis. Grosch's table of one hundred and twenty cases of antiseptic excisions of the hip show the same thing. Here, with a mortality of 36.7 per cent., more than half the deaths were due to tubercular affections. These results have certainly not been due in every case to the steady advance of general tubercular disease which existed before the operation, and anyone who will carefully weigh the evidence which is now accumulating from all sides, and especially Weigert's researches on extension of the process through the veins, and Arnold's observations in the same field, can come to but one conclusion, namely, that the general affection has been set up in very many cases by extension from the local joint disease, just as sarcoma and carcinoma become generalized from a primary source.

As to the question of formal classic excisions with sawing off of the entire ends of bones, Mr. Barker predicts that after the next few years, when the principles underlying the treatment of tubercular disease are better understood and the necessity of early operation is recognized, such operations will be some of the rarest in surgery, and will be replaced entirely by the extirpation of localized foci in the bones without any sacrifice of their length and growing power. That this will affect the subsequent course of the whole tubercular process in the system he also believes that time will show, when we have accumulated enough cases operated on by the newer methods for reliable statistics.

Much freer explorations of joints by incision than have hitherto been practiced is now justifiable, as we may be assured that, with care, there is little or no risk, and that much of the difficulty of diagnosis of tubercular conditions in an early stage will thus be overcome. This difficulty in determining the exact stage of the disease and its primary seat in a joint is, of course, one of the chief obstacles to our successful treatment of it by operation. If we could in all cases localize the primary focus early, we should be able in a very large proportion of them to extirpate it before it had infected the surrounding tissues or had poured its virus into the circulation either through the lymphatic system or through eroded veins. Not only should this be possible, but it has been shown to be feasible without seriously impairing the functions of

the articulation by many cases recently placed upon record by several surgeons, and notably by Koenig and Sendler in the case of the knee. But unless formal exploratory operations are frequently resorted to at an early stage of the disease such results will be few and far between.

Tuberculosis of Sheath of Tendon.—Charters Symonds²_{v.1,p.21} related the case of a young girl who came under treatment with a small growth of the sheath of the flexor tendon of the index finger resembling a ganglion. The tumor was incised, and the girl completely recovered. Similar growths occurred in the palms. He mentioned two other cases, and showed a microscopical specimen of the growth in the first case, which presented a typical tubercular structure. Treves referred to the literature of the subject, and said that it would seem that few cases terminated so favorably as Mr. Symonds'. Gill has made five hundred and eighty-four autopsies upon children dying with acute infectious diseases, and in one hundred and ninety-eight cases found tuberculous changes of different organs. It was chiefly after the third year that the tuberculosis, which was until then latent, developed itself upon the occurrence of acute disease. The organs attacked most frequently were the intestinal glands (one hundred and eighty-five), the lungs and the pleura (eighty-nine). The disease of the lungs was often secondary to the perforation of a bronchus by an inflamed and suppurating tuberculous gland. The patients were from the poorer classes of the population. From the statistics of Maas we learn that in one thousand two hundred and eighty-nine cases of tuberculosis the bones and joints were affected in nine hundred and seventy-eight, and of these the knee-joint was involved in 23 per cent. The disease began as a localized rarefying osteitis affecting the cancellated portion.

Kölischer¹¹⁸_{v.20, No. 48} reports successes with a local treatment of tubercular diseases with phosphate of lime, injecting it in solution into the affected joints, and when they had already been opened packing them with a gauze impregnated with the same salt. He believes the method to be more applicable to wounds occurring in children than in adults. G. D. Hough,¹_{Dec. 21, '87} premises that acute suppuration is always due to the entrance of micro-organisms into the tissues, and when abscesses are of tubercular origin, recommends in the treatment of both evacuation through sound skin, thorough

scraping of the abscess cavity the introduction of horse-hair drains, and the application of sutures, so as to obliterate as far as possible the entire cavity. He reports a series of cases with excellent results.

Verneuil,¹⁰⁰_{Jan. 21} divides his cases of surgical tuberculosis into several groups, according to age. With old people he believes it is not generally necessary to interfere surgically, as the lesions run a slow course. With adults he believes in conservative surgery as regards certain articulations,—the wrists and the elbows, for example; but in those where the ankle is affected the temperature will usually fall. In about 50 per cent. of adolescents tuberculous joints can be preserved and are subsequently useful, and in very young children one will succeed, in the majority of cases, in preserving the function of the joint.

ADENOPATHIES.

Physiology.—Wallace Wood,¹_{Aug. 4} in an elaborate paper on the anatomy and physiology of glands, comes to the conclusion that there is a glandular temperament or constitution just as there is a nervous or a muscular, and that its foundation is to be found in the intestinal and urogenital glandular system.

Palpation of the Lymphatic Glands.—The *résumé* of a paper by Dietrich⁴⁵_{p. 309},²⁵_{Aug. 20} on this subject is taken from the reports of the Physical and Medical Society of Erlangen. The first part of the work deals with palpation of the glands in health. Of four hundred and thirty-nine healthy soldiers and students, some of the glands were palpable in 99 per cent., namely: the occipital glands in 2.2 per cent., the axillary in 72.4 per cent., the cervical and supraclavicular in 79.4 per cent., the cubital in 82.6 per cent., and the inguinal in 92.9 per cent. Excluding one hundred and twenty-one cases in which some affection of the skin was present, and ninety-eight cases in which there had been some preceding disease which might perhaps have influenced the adenopathy, there still remain two hundred and twenty healthy persons, in a similar percentage of whom glands could be felt. It thus appears that in almost all healthy persons the glands are palpable in one or other region of the body. In the case of the inguinal, cubital, and cervical glands, these on both sides of the body are mostly affected, but as regards the axillary, the enlargement is as often on one side

only as on both, while the occipital are usually palpable on one side only. In children up to twelve years old the glands can be felt more frequently than in adults. The number of palpable glands in the different regions of the body are greatest where most glands are normally situated, and diminishes with increasing age. The size of the glands does not depend upon age, the average size being from that of a lentil to that of a bean. In the second part of the paper the condition of the glands in syphilis is dealt with. Of fifty patients with early secondary syphilis, the occipital glands were palpable in 8 per cent., the cervical in 98 per cent., the axillary in 90 per cent., the cubital in 72 per cent., and the inguinal in 100 per cent. Thus, the percentage of palpable glands was found to be greater in syphilis than in health, and the average number of glands in the several regions and their volume was also increased.

Contrary to the opinion of most authors, but in accordance with that of Baumler, enlargement of the cubital glands is not looked upon as characteristic of general syphilis, for neither in size nor in number were these glands found to be larger in syphilis than in health.

In the author's cases, indeed, though perhaps this was accidental, the cubical glands were palpable more frequently in the healthy than in the syphilitic.

At the Congress for the Study of Tuberculosis, Paris, July 27th, Duret³_{Aug. 10} read a paper on "Tuberculosis of the Glands." He recognized three forms of the affection:—

1. Fibro-caseoma.
2. Simple caseo-tuberculosis.
3. Suppurative caseo-tuberculosis.

The treatment of the first form should consist in extirpation of the affected glands. In the second form the author advised ignipuncture and scraping out of the caseous material. In the third form, in which ulcers or fistulous tracts exist, his plan was to destroy the fungous granulations with the thermocautery.

Micro-polyadenopathy of Children.—Legroux, of Paris,⁸_{Aug. 10},⁹_{Aug. 25} said that we all know of these small enlargements of the lymphatic glands, which are commonly found in the neck of children, especially those living in places where hygienic conditions are wanting. To this lesion he has given the name of infantile micro-polyadeno-

pathy. The inflamed glands are particularly situated at the neck, and can be attributed to dentition or the lymphatic state. They are movable and painless; they are also found in the axilla, inguinal region, etc.; they may disappear with the advance of age, but are also frequently followed by variable accidents. They are found in children presenting tuberculous manifestations. If such children die of measles, for instance, we often find caseous tracheobronchial glands, latent tubercular pleurisy, or peritonitis. If meningitis appear and this polyadenitis exist, we are able to affirm a tubercular meningitis.

Daremborg, of Cannes, had seen, on several occasions, this specific polyadenopathy in relation with tubercular tonsils; this tubercular tonsillitis is easily produced by the cohabitation of children with tubercular patients.

Chavasse³⁵_{May 21} reports three cases of interstitial antiseptic injection in cervical adenophlegmons, with rapid cure in each case. In two of them he employed a 5 per cent. carbolic solution, in the other a one to one thousand sublimate solution, the latter giving considerable pain.

John Cameron,²²_{June 12} reports a case of bronchocele successfully treated by the administration of fifteen minims (one gramme) of a one-half per cent. solution of fluoric acid, three times daily. This is the second case he has seen cured by this means.

Bremer,⁵_{June} reports a case of malignant œdema and fatty embolism, reviews the history of similar cases, and concludes as follows:—

1. Malignant œdema in man is apt to make its appearance in low states of nutrition; in the chronic insane, for example; or in persons otherwise run down in health and weakened by previous, and especially by infectious, diseases.

2. Whether it ever occurs in the body from free pathogenic germs, or whether it is simply an accompaniment of other putrid infections, is an open question.

3. It may be that when it occurs in diphtheria it is only in the septic forms of that disease that it is observed.

The fact that in his patient a gas formed in the subcutaneous areola tissue and was fetid tends to show that in addition to the bacillus of malignant œdema there must have been other microbes at work, for the gas of experimental malignant œdema has no

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odor, *i.e.*, the bacillus under consideration can be classed among the putrefactive micro-organisms.

SURGICAL DISEASES.

By CHRISTOPHER JOHNSTON, M.D.,
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RABIES.

AS TIME rolls on the interest taken by the medical world in hydrophobia does not lessen. The disease even, if we may believe Parisian authorities, seems on the increase in the French capital, the centre of Pasteurism; but, as the ratio of mortality appears to rule evenly as ever, skeptics, both at home and abroad, criticise the French philosopher, sometimes a little rudely, denying all hydrophobia; others, as doubters, almost refuse to admit the disease into the nosology, and call by the title pseudo-hydrophobia nearly all of the cases presented. Then we have hydrophobia fully accredited, as well as the prophylactic treatment, by Pasteur; the nervous theory of Duboué, of Peyraud's tanacetic or non-virulent *similirage* and of its relations with true hydrophobia; and lastly, the use of vigorous measures to reduce the number of dogs, and particularly to destroy the itinerant canines.

Pasteurism would seem to be gaining ground if we judge by the enthusiasm with which the new Institute in Paris was opened, and by the apparently successful working of similar establishments in Russia and Brazil. But it is not accepted in Germany or Belgium or Italy or by the Budget Committee in Austria.⁸ It is declared by many to be incomprehensible to them how the disease can be cured or prevented by the poison which produced it; and F. M. Davis, of Groveton, Texas,⁸⁵ cries out, "*Is this not an immortalizing score for Hahnemann?*"

Of course, interest centres in the work of Pasteur, in spite of the alleged incongruities of his method, for it is a bold thing, and, in the case of the "intensive" treatment, a hazardous thing, inasmuch as the results leave much in doubt as to the cause of death in "failures;" but we find still some who denounce the method and yet express themselves as prone to undergo the full measure of it in case they are bitten.

Among those who scout at the idea of the frequency of rabies is G. Archie Stockwell, of Port Huron, Michigan,⁸⁰ who in a recent paper sets forth a series of statements to "allay in some measure the senseless alarm that accrues to the laity and the profession alike, owing to the wide-spread publicity given to cases which, if not altogether spurious, are, at the least, of most doubtful character." In that paper he tells us that formerly a mad dog was as rare as a black swan; but now, under the influence of sensation, hydrophobia has become nearly as common as measles. "Sixty thousand dogs," says this writer, "upon what grounds we know not, have been recently slaughtered in a very brief space of time in the city of London alone, and yet during all this time the British Hydrophobia Commission, according to Charles Bell Taylor, were unable to secure a definitely rabid canine for purposes of experimentation." Quoting from the report of W. Pavin, Superintendent of the Home for Lost and Starving Dogs at Battersea, Park Row, London, the author makes it appear that during his seventeen years of experience he *never saw a case of rabies*; and Scoberio, Secretary of the same Institution, declares¹⁰⁶⁸ that notwithstanding *ninety-five thousand* dogs were seized on the street and brought by hand to the police-station, and the frequency of severe bites, hydrophobia has never occurred among the members of the Metropolitan Police. . . . Altogether, *two hundred thousand* dogs have been brought to the "Home," most of them starving, stray, or vagabond, and of these many exhibited evidence of disease and were most circumstantially accused of rabies; yet *without exception*, when isolated and properly fed and cared for, all recovered. "What, then, is rabies, or what is it believed to be?"

The proportion of canines that develop rabies as the sequel to wounds inflicted by other and *known* rabid carnivora would seem to be extremely small. One author quotes them as less than 5 per cent., giving instances in which many animals bitten several times often recovered without mishap; and he cites Hunter as fixing the proportion of one in *twenty-one*; Hamilton, one in *twenty-four*; Nieuman, one in *thirty-five*, and Fabre, but *thirty-one* out of a total of *nine hundred and thirty-two*. And Youatt treated four hundred members of the human race supposed to have been bitten by rabid creatures without a single failure. H. Voeller, of Sacra-

mento,¹⁴⁷ however, in speaking of immunity, makes Youatt say that two dogs out of three bitten become rabid. Cattle and sheep are far less susceptible, and man the least so, for Hunter estimated the proportion as one in twenty and Hamilton one in twenty-five. According to this computation two-thirds of the persons bitten escape the disease, and of the thousands of persons who have attended on patients with hydrophobia no authentic instance has been recorded in which the disease was contracted either by attendance during life or infection after death.

These facts, perhaps, and others also, have paved the way for a disbelief in some minds in the theories of Pasteur. C. W. Dulles, in a "Report on Hydrophobia," Pasteur's method,⁵⁹ Nov. 20, '87 says that the claim that Pasteur has discovered a preventive for hydrophobia after the bite of a rabid dog rests upon two principal fallacies. One of these is the presumption (fallacy) that hydrophobia is a specific inoculable disease; and the second fallacy is that Pasteur's method has saved a large number of persons (so inoculated by rabid animals) who, but for it, would have died of hydrophobia.

Dr. Dulles believes that Pasteur's attenuation is an artificial disease, and that this has nothing to do with hydrophobia; that Pasteur has turned his back upon the natural vehicle of the contagion of hydrophobia—if it is admitted that hydrophobia has any contagion—the saliva, and experiments with dried spinal cords, which no pig, cow, dog, wolf, rabbit, or other animal ever used upon its victim, or could use were he ever so mad.

To support this proposition, Dr. Dulles uses argument and statistics; alleges that many patients have died after Pasteur's treatment; that some may have been killed by his inoculations; and that this method ought to be rejected and condemned in the interest of humanity as well as science.

A great number of cases of hydrophobia have been reported in several countries with very nearly the same array of symptoms, and all terminating in death. But a careful study of these cases will convince the adept that hydrophobia was not incontestably present in them all. In some hydrophobia, ærophobia, laryngeal and pharyngeal spasms, and all the rabic symptoms defined as pathognomonic were most intensely marked, according to Stockwell,⁸⁰ April 16, and yet the dog lived and the patient recovered. If the dog die without paralysis of both jaws and of the posterior extrem-

ities, says the same author, it is not rabic. If it die paralyzed search for probable causes, which may be found outside of hydrophobia. Indeed, it is a constant rule for those having faith in Pasteur that the dog which has bitten a person must be preserved and kept under observation, and if it die inoculation of its medulla must be made upon other dogs, which, if it has died of rabies, will, or ought to, manifest the disease. But the opponents of Pasteur claim that an artificial disease may be originated which can produce symptoms more or less like those of genuine rabies and kill the inoculated, all of which is indignantly denied by Pasteur and his adherents.

Rabies is universally recognized as a disease of transmission and as never originating spontaneously. When inoculated from animal to animal by the bite it is evident that much variation must be found, first, as to the different susceptibilities of different animals, and, second, as to the particular manifestations of the disease induced. Again, it is still with some an open question whether the saliva alone contains the virus, or whether, in artificial inoculation, portions of the medulla may take the place of the natural vehicle; or, again, whether the same virus affects all other animals indifferently. Besides, there enters into the question, according to Vincent Richards,²⁰⁶_{July} the possibility or probability that the saliva of rabid animals does not contain the infecting materials at all stages and at all periods throughout the existence of the disease, and certainly not in the same intensity or proportion. The views of its nature also vary; thus, according to Richards, it is of a distinctly chemical or proteid nature, and not of the character of an organism. W. G. Ashby, of Virginia,¹_{Dec. 21, '97} is induced to adopt the opinion that hydrophobia in the dog is a state of uræmic poisoning, the ptomaine being produced by a fermentative action of the disordered nervous system. Pasteur, as no bacillus of hydrophobia has ever been discovered, must needs content himself with a virus, or fluid, and herein lies one of the great difficulties of his case; and, finally, Babès²¹¹_{Sept. 16} is reported as being unable to determine the nature of the virus, although in general it behaves under the influence of attenuation as bacteria, in showing itself more refractory to certain chemical agents.

It is well known that the vaccinal fluid at present employed consists of a suspension of spinal cord broken down in water, and,

as we shall see further on, this fluid is prepared with more or less attenuation. On the 18th of January, 1881, at a session of the Académie de Medecine, Pasteur said: "I have inoculated two rabbits with the saliva of a child who died of hydrophobia." On the 31st of May of the same year Pasteur thus expressed himself at the Academy: "Considering our failure to communicate rabies by inoculation of the blood of rabid animals, we are led to suppose that the central nervous system, and preferably the bulb, is particularly interested and active in the development of rabies. Consequently the announcement of constant and rapid successes of the inoculation of rabic cerebral matter done by trepanation."

In a volume¹⁰⁰⁹ published before 1880 may be found the following passage, which led the author to the indication of a rational treatment of this affection and dictated to Pasteur his change of direction: "The agent producing rabies is not absorbed. It propagates itself insensibly even to the central nervous system, along the nervous fibres which have been reached by the virulent liquid." In his communication to the Academy, May, 1881, quoted above, Pasteur declared: "This opinion was sustained with distinction two years ago by M. Duboué."

Recent experiments²¹¹_{Dec. 25, '87} with regard to the mode of propagation of the rabic virus in the organism revives the opportunity of discussing the "nervous theory" of Duboué. It affirms, on the one hand, that the central nervous system is the necessary terminus of the virus of rabies, and, on the other, it assumes that in going from the wound of inoculation to the centres the virus follows the nervous system, and can pursue that route only.

The first part only of the theory has until the present received a full confirmation; the localization of the virus of rabies in the nervous centres has been superabundantly demonstrated by the work of Pasteur. But the second point still remains in the field of controversy. Without, however, following out the details of the application of Duboué's theory, we leave this author, after reproducing his two excellent precepts: "1. The chances of success in a vaccination are proportional to the rapidity with which the vaccinal fluid reaches the nervous centre; and in making the vaccinal inoculations *as near as possible to the rachidian bulb*, at the back of the neck, for example, there would be more chance of success than in doing the same operation in a more distant

region, in the hypochondrium, for instance. 2. Far from endeavoring, in a general manner, to render the treatment more intense, that is to say, more dangerous, it were better to attenuate it, to render it less and less perilous, withal, in leaving the necessary maximum of power. The end to reach would be this: endeavor to obtain the desirable degree of security, if that is possible, with intermediary virus of the rabic gamut, that is to say, with virus incapable of killing, but very much akin to that which can kill."

But it is really the experiments of Di Vestea and Zagari,^{537 211}
^{V.9, Dec.25} which appear to prove the nervous propagation of the rabic virus. The intra-nervous inoculation of rabic virus excites rabies with more facility than subcutaneous inoculation; it is not more easily but more certainly successful, and the time of incubation is shorter, although not so short as after subdural injection. In these experiments it is really by the nervous fibres themselves that the virus is propagated; for if it were absorbed by the lymphatic ways which it meets with it would be incomprehensible how, by the nerves, the efficacy should be greater and the incubation shorter than by the subcutaneous inoculation.

The work, carried on under the auspices of Cantini, shows the possibility of transmission of the rabic virus through the nerves, and that the intra-nervous inoculation is the more effective as it is practiced more deeply in the nerve itself. The authors have discovered a series of very interesting facts, to which we refer as follows: The communication of rabies through introduction of the virus into a nerve succeeds with equal certainty, as in the subdural injections practiced by Pasteur, Spälten or others; the intervening period of incubation lasts in the case of communication of common street virus eighteen days, in the case of infection with fixed virus nine days. As the first visible symptom there is observed in rabbits infected through a nerve a disturbance of mobility in the corresponding extremity, which reveals itself by a certain rigidity and awkwardness in the motions of that extremity. When the inoculation is in the sciatic nerve, first one and then the other leg becomes paralyzed, and gradually the paralysis extends to the upper extremities. In case the median nerve shall have been used to receive the inoculation, the paralysis is descending, and shows great analogy with the paralyzes of rabbits inoculated by

trephining. In the latter case the authors observed a very characteristic temperature curve. From the fifth day after infection the temperature rises with light, febrile movements, to fall suddenly with the coming on of the first paralytic symptoms until the resulting death. Specimens of blood during the fever period were inoculated in other rabbits, but always with negative results.

When portions of the spinal cord taken from animals killed or having died spontaneously at this period of the disease were inoculated into rabbits, the surprising fact was developed that those animals inoculated from the median spinal bulb became rabid, while the lumbar bulb showed itself not yet virulent at this period. The authors conclude from this that the rabic virus develops from the infected point along the cerebro-spinal system and localizes itself in parts remote from the point of inoculation later than in parts of the central nervous system lying near the point of inoculation. They prove this supposition to be true by a number of experiments in applying the virus to the sciatic or median nerve, from which it appears that in the former case the lumbar cord becomes virulent earlier than the cervical cord and bulbous portion, while the case is reversed when the virus is applied to the median. In both cases the paralysis becomes general, but remains predominant on the side of inoculation. In the last period of the disease which follows the inoculation of the sciatic, symptoms of excitability and hyperthermia manifest themselves which are referable to the invasion of the bulb and the brain, and which, in the case of intra-cranial inoculation, are, on the contrary, the most precocious, and precede all paralytic manifestation. The functional trouble demands a certain degree of concentration of the virus; the nervous centres are relatively tolerant of the rabic virus.

Finally, Vestea and Zagari have made a fundamental experiment, which would be decisive if it were not at this time unique. A rabbit having undergone section of the spinal marrow, a rabic inoculation in the sciatic gave no indication of invasion of the superior portions of the spinal axis fifteen days later; and the authors, having sacrificed the animal, proved that the two sciatics and the lumbar cord were virulent, while the medullary segment above the sections contained no rabic virus.

In connection with the foregoing we adduce the experiment

of Brown-Séguar^d,⁸ referred to at a meeting of the Society of Biology in April. He said that in the majority of cases of human rabies which he had observed, he established the fact that the appearance of rabic phenomena was preceded by a pain starting from the bite and being transmitted to the nervous centres after the manner of an aura anticipating certain attacks of epilepsy. These facts led him to think that the nervous system plays the same part as in tetanus; he believed that the rabic attack was provoked by the introduction into the economy of a virus whose action was transmitted, dynamically at first and organically afterward, to the bulb.

It occurred to him that in dividing the nerves serving for the transmission of this virus immediately or shortly after the bite the development of the disease might be prevented. Brown-Séguar^d now recognizes the fact that his experiments upon the animals inoculated for rabies gave a complete denial to this theory. The animals which underwent section of the nerves after the inoculation died a little more rapidly than the animals which remained in evidence.

Are we, therefore, authorized in saying that the nervous system takes no part in the production of rabies? The experimenter thinks not.

Some very curious facts may be referred to for a moment, and they may be presented as follows. The subcutaneous injection, starting with a certain dose and a certain quality of the virus, determines complete rabies the less easily as the dose is stronger and the dose more active. To interpret this paradoxical result Pasteur invokes the vaccinal matter, without denying, but far from it, that a chemical substance serves as an intermediary between the virulent elements and the organism. But this hypothesis may not be able to clear up the facts in question.

We cannot, however,⁹² admit the existence of a soluble matter capable of sterilizing the organism by a toxic power with regard to the virus. That is not the same as to reject the intervention of soluble products in the production of immunity; for these soluble products may be understood in many ways, and the production of immunity can be conceived quite differently from the action of products fabricated by the virulent elements and endowed by them with a toxic power.

Let us look at the matter practically. In 1887 rabies caused in Paris¹⁴ and in the suburban communes of Paris the death of *nine* persons.

In 1880 rabies caused the death of 4 persons.						
" 1881	"	"	"	"	"	21
" 1882	"	"	"	"	"	9
" 1883	"	"	"	"	"	4
" 1884	"	"	"	"	"	3
" 1885	"	"	"	"	"	22
" 1886	"	"	"	"	"	3
" 1887	"	"	"	"	"	9

The same journal¹⁴ states that whereas, thanks to the method of Pasteur, the mortality of rabies in man diminishes from day to day, unfortunately rabies increases in the dog from year to year, as appears by the following report. Thus, for the Department of the Seine the number of rabid animals has pursued the following progression :—

In 1883,	.	.	.	.	.	.	.	.	.	182
" 1884,	.	.	.	.	.	.	.	.	.	301
" 1885,	.	.	.	.	.	.	.	.	.	518
" 1886,	.	.	.	.	.	.	.	.	.	604
" 1887,	.	.	.	.	.	.	.	.	.	644

This ever-increasing source of human rabies demands attention, for it happens that in Berlin,²¹¹ owing to the energetic police measures, rabies has completely disappeared. In the Grand Duchy of Baden and in Wurtemberg rabies has become so rare that it has almost vanished by the employment of vigorous means to reduce the number of dogs, and especially to destroy the wandering dogs. And the same journal in a common-sense way observes that the peril of this terrible affliction will be averted in a more natural manner than vaccination, that is to say, by regulating the question of dogs.

As will be seen by preceding table, in the year 1887, out of three hundred and fifty persons bitten by rabid dogs or dogs suspected of being hydrophobic, there were nine deaths. In the same Department of the Seine²¹¹ in former years there were registered fourteen or seventeen, and even twenty deaths, that is to say, before the application of the Pasteurian method.

Out of three hundred and fifty persons bitten three hundred and six applied to Pasteur and two died ; forty-four did not think it necessary to go to Pasteur and seven are dead. Thus 0.67 per cent. deaths of the first and 15 per cent. of the second. Here appears,

certainly, a statistic which speaks decidedly in favor of Pasteur's method, and which justifies the confidence of those bitten in its efficacy.

But this advantageous result,⁷⁰ is more apparent than real. Formerly the annual total of persons bitten in the whole extent of a territory was unknown. The only means of treatment was a more or less active cautery, aqua ammonia, carbolic acid—rarely, however, the energetic acids or the red iron, and these long after the opportune moment. Besides, the total number of cases of bite could not be ascertained, while, on the contrary, that of hydrophobic deaths was exactly known. Before the existence of the method of Pasteur an error in statistics appeared altogether at the expense of the cases of immunity. In spite of all that, these latter were still estimated at about four-fifths of all the bites it was possible to verify.

Really, since the action of the antirabic vaccination, the conditions as to statistics have changed remarkably. First, the number of persons bitten and supposed to be contaminated is perfectly ascertained. This number is augmented by lesions owing to dogs simply under suspicion. Everybody affected having recourse to vaccinations, it follows that with the number of cases of rabies remaining nearly about the same as in the past the relation of the two factors appears to the advantage of Pasteur, who figures to his credit all immunities, whether spontaneous or due to treatment. The method has, however, says Perron, brilliantly, incontestably, proved itself worthy in the preliminary attempts made upon animals by its inventor.

Formerly the experiments of von Frisch, of Vienna, upon dogs inoculated according to Pasteur's method set the medical world against Pasteur; but Babès,²⁰_{Dec. 14, '87} of Bucharest, more than redeems his credit by the results of a series of very recent inoculations also practiced upon dogs. This experimenter did forty-two preventive inoculations upon dogs. He inoculated fifteen dogs which had been bitten and practiced numerous inoculations upon animals infected by trephining. It was very remarkable that while Pasteur could save but 60 per cent. of dogs treated by prevention and infected by trephining, Babès by his method lost no trephined dog after preventive injections, or when these had been done immediately after the infecting trepanning. For preventive

inoculations he practices in a dog, in the interval of twelve to fifteen dogs, twenty injections with medullas of from thirteen days to one day by means of a Pravaz syringe. For dogs having been trepanned he commences his inoculations *one half hour afterward*, for if begun twenty-four hours after trephining they do not prevent rabies. For three consecutive days he makes six injections with the Pravaz syringe, beginning each time with medullas of twelve to eleven days, and ending with those of from two to one.

Babès is satisfied that preventive inoculations are not the most rational means to be employed against rabies, but that they are indicated by the immediate necessity of the moment, without settling the question.

As to the "intensive" treatment of Pasteur, he is openly criticised. Thus one writer²⁶_{Mar. 1} declares that Pasteur's protective inoculation in man also led, in a certain percentage of cases, to fatal results, and Renand Suzor⁶_{Feb. 4} makes the statement that the opponents of the system grant that the simple treatment is harmless in itself, but the intensive treatment, say they, is positively dangerous. Persons who have submitted themselves to it have died of paralytic rabies, a disease which was unknown to man before. On the other hand, O. Bujvid, of Warsaw,²¹_{V. 22, p. 196}; ²¹¹_{May 13} satisfied himself, by an examination of facts and by experimentation, that inoculations with weak rabic virus were without result in wounds severe by their number or their seat. By invitation of Pasteur, he resolved to try the intensive treatment and did so for the first time upon two peasants who had been bitten in the month of August by a rabid wolf (rabies was proven experimentally). The two patients had been bitten a great many times, especially upon the face, and received nineteen injections in eleven days; a little later (in September) he employed the same method with two other peasants bitten by a wolf about the face and head. At the time of writing, April 2d, the four patients were doing well. Since that period Bujvid has used the intensive method in one hundred and seventy cases, in which there were wounds of the face, and two only died. Out of a total of four hundred and thirty persons inoculated in Warsaw there have been, up to date, only eight deaths. It is to be observed that inoculations were made in those cases only in which rabies in the dog had been demonstrated.

With regard to intra-venous injection we have to state that

the experience of Galtier, of Lyons,²⁶²_{July} repeated by Nocard and Roux, give the same results: (1) intra-venous injection of rabid medulla does not give rabies to small ruminants and confers immunity upon them; (2) this method can prevent rabies after inoculation into the eye, and, consequently, after a bite. And again, Galtier has proven that venous injections obtained from the animal which inflicted the bite, or from any other, can, if they are made within twenty-four hours after the injury, prevent bitten herbivorous animals from becoming rabid.

Of course, everything touching this grave disorder is of extreme interest. At a meeting of the Council of Hygiene,⁵⁹_{Aug. 11} the President announced that several persons had made a written application to the Prefect of Police requesting Pasteur to furnish "indications and instructions on the first symptoms of rabies in dogs and cats." Pasteur, always faithful to the principles of exact science, replied,⁷³_{June 30} that "it is impossible to define in an absolute manner the characteristic symptoms of rabies. Even the most expert men may sometimes make an erroneous diagnosis."

And here let us add that in the numerous discussions which have taken place at the Academy, says L. A. de St. Germain,¹¹⁸_{Mar.} "I call to mind an assertion of a celebrated veterinary, Leblanc, which struck me forcibly. This practitioner, in a long career, had never, he declared, observed a *bitch* go mad spontaneously."

It would be hardly fair to close this brief notice of hydrophobia without referring to the labors of H. Peyraud, of Libourne, in the field of immunity by chemical vaccinations. It is well known that in the month of March, 1872, Peyraud,²¹¹_{Oct. 28} in making experiments with the view of studying the biological action of some vegetable essences, was greatly surprised to observe one of them, extracted from the *Tanacetum vulgare*, occasion in animals a series of phenomena altogether like those met with in rabies; not that there was ever a supposed identity of rabies with the tansy affection, for the medulla of rabbits inoculated with the essence of tansy was never found to be virulent.

There might even be admitted a complete parity between two affections, of which one is produced by an organic ferment, very probably microbian, the other by a chemical poison created by vegetable cells. What there is in common between them is the similitude of action and probably of chemical composition between

the two products, the one preformed and the other secreted. Following the law indicated above and by analogy, the essence of tansy may be admitted to be isomeric with the rabic poison.

Quite recently the Germans obtained from tetanic patients a defined poison, a crystallized ptomaine isomeric with strychnine and susceptible of producing the same effects; but this experimental tetanus is not contagious, because the leucomaine has been separated from its primitive ferment, that is to say, from the microbes which produced it. The tanacetic poison, on the contrary, is a true vegetable chemical vaccine agent, definite, dosable, a sort of vegetable leucomaine, *isomeric with the rabic poison*, and whose action can be balanced.

With these ideas Peyraud follows out his researches and experiments upon the prevention of rabies by the tanacetic vaccination or chloral. Our corresponding editor, Dr. de Pietra Santa, states that upon injecting essence of tansy into the veins of an animal, phenomena of excitation were produced by Peyraud so analogous to those of hydrophobia as to allow of their being called artificial rabies, tanacetic rabies, or simili-rabies. But these convulsive symptoms may be prevented or put an end to by the repeated and prolonged administration of chloral (even in the dose of forty-six grains per day).

Other experiments made by Peyraud in the physiological laboratory of the Faculty of Medicine of Bordeaux have shown:

1. The preventive action of chloral.
2. The immunity conferred by the essence of tansy, a *rabigène* substance employed in subcutaneous or intra-venous injections.
3. The chemical nature of this substance, a sort of vegetable leucomaine, which, introduced by inoculation (tanacetic inoculation), constitutes a real vaccination, whence the designation of *chemical vaccine*.

In conclusion, we can only state that the researches of Peyraud have been submitted by the Academy of Medicine to the examination and criticism of a Commission composed of Dujardin-Beaumetz and Trasbot.

Whatever may be thought by skeptics of the value of Pasteur's methods, that gentleman enjoyed in Paris on November 14th a great and gratifying triumph. On that day the Pasteur

Institute⁹_{Dec.1} was opened by the President of the Republic, who was accompanied by a large number of distinguished men. Addresses were made by Bertrand, Permanent Secretary of the Academy of Sciences, and Professor Grancher, and Pasteur's son read a speech for his father, who was too much impressed by all that had been said to be able to read it himself. Professor Grancher made an exhaustive *résumé* of the labors of Pasteur; spoke of the antirabic institutions throughout the world: in Russia, seven—in Odessa, St. Petersburg, Moscow, Warsaw, Charkow, Samara, and Tiflis; in Italy, five—at Naples, Milan, Turin, Palermo, Bologna, these last two having been recently created and sustained by the King; one in Vienna; one in Barcelona; one in Bucharest; one in Rio de Janeiro; one in Havana; one in Buenos Ayres; in Chicago and Malta two new laboratories are being organized; and, finally, the Antirabic Institute of Paris, which is in continuous relation with all these laboratories.

Grancher claimed a general concordance of results in these institutions, and claimed for that of Paris so low a mortality as 0.77 per cent. in 1888, or, excluding persons who died from hydrophobia within fifteen days that follow treatment, 0.55 per cent. as against 15.90 per cent. in persons who had not reported for vaccination. And the announcement was made that Pasteur's Institute had been divided into six departments, viz.: Department for the Treatment of Hydrophobia; Department of General Bacteriology; Department of Medical Bacteriology, which will be subdivided into two sections—first, Section on Methods; second, Section of Research; Department of Morphological Bacteriology; and, finally, Department of Bacteriology applied to Hygiene.

TETANUS.

Is tetanus essentially a disease of the blood or of the nervous system? Is it infectious or not? Is the tetanus of horses identical with that of man? Is it transmissible from horse to man, man to horse, and man to man? An answer to these questions would cover much of the debatable ground of a year ago, and we propose to show what advances have been made toward a solution of the problems involved.

Recently in France Verneuil has put forward the hypothesis that *tetanus in man is derived from the lower animals*, which, of

course, includes the idea of its being infectious. In a long and comprehensive paper⁹¹ the French surgeon gives brief histories of a large number of cases and observations furnished him by his compatriots. He arranges them under headings as follows:—

1. Professions which especially expose wounded persons to the danger of contracting tetanus.
2. Concerning the inoculation of tetanic virus by the instrument which inflicts the wound, or by applications probably contaminated with this virus, as certain earths and dung.
3. The transmission of tetanus from horse to man, from man to horse, and from man to man.
4. Consideration of negative cases.

Among the two hundred observations⁹⁶ certain occupations of the sufferer are so common, and certain modes of receiving the injury so frequent, that Verneuil feels driven to the conclusion that after different forms of accident, and in the case of persons of different professions, there is great inequality in the respective liability to contract tetanus. He endeavors to show that in a given number of cases the chances are largely in favor of tracing it to equine influences.

According to him, this equine influence is exercised in many ways, some direct and others indirect:—

1. When a man is wounded by an instrument which has been used on a horse.

2. When he has been bitten or wounded by a horse.

3. When, being wounded, he has remained in more or less continued contact with the horse.

4. When he is wounded by a fall from a horse or from a vehicle.

5. When, being wounded in some way, his wound is contaminated with horse-excrements or by earth impregnated with them.

6. When his occupation brings him into constant contact with horses, with their excrements, or with earth impregnated with the latter.

Verneuil divides his cases into four great classes:—

The first includes persons by profession habitually in contact with horses, such as carmen, farm-servants, stablemen, farmers, laborers, farriers, horse-dealers, veterinary surgeons, knackers, etc., and, supplementary to these, persons working regularly upon land

cultivated with the aid of animal manures, and, above all, with horse-dung, such as gardeners, and also navvies.

In the second category are placed persons of what profession soever whom chance has brought into passing contact with either sick or healthful horses, who have been wounded by these horses or by appliances used daily with or upon the animals, that is, harness, whips, carriages, or agricultural implements; or whose wounds have been soiled by horse-excrements or by earth impregnated with them. In this class are included a long list of persons with tetanus after injury by horse-bites, kicks, dressings made with dung, street-dirt, stable-runnings, immersion of the wounds in water from horse-ponds, cattle-troughs, etc.

In the third class are grouped all persons with tetanus who have been in relation, more or less directly, with other persons (or animals) having tetanus. The study of these leads to that of the transmissibility of tetanus from the horse to man, perhaps from man to the horse, certainly from man to man.

The fourth class includes the cases, still rather numerous, in which no relation, direct or indirect, can be traced between the wounded man, on the one hand, and, on the other, any man with tetanus, any horse, sick or well, or any article connected with the soil.

The first class forms more than half of the observations collected, which fact furnished the strongest argument in favor of the theory. Many of them are very striking; for instance, when the wound has been dressed with horse-dung, or where horses have died of tetanus in the same building a short time before the injury has occurred to the human patient.

In another paper ⁹¹_{Dec. '87; Mar. '88} eighty-six other cases are added to the two hundred already referred to, all tending in the same direction. Among them, however, a remarkable case is selected and deserves reproduction. Verneuil remarks that while direct contagion from horse to horse, at least in acute tetanus, is exceptional and hardly contestable, it appears that transmission from man to man is easier and more frequent. He brings forward, however, two or three cases only, but which plead in favor of direct or indirect inter-human contagion. The wife of a patient of Plain is delivered of a child which dies of tetanus in consequence of prolapsus of the umbilical cord. Soon afterward this woman takes a nurse-child,

which also dies when the cord is detached. Fifteen days afterward the family horse contracts tetanus, in appearance spontaneous, which is tedious, but ends in recovery.

Before the recovery of the horse the woman is taken in her turn with the same chronic form of tetanus and escapes death. And we may here remark that the tetanic woman could have taken the disease as well from her own child or the nurseling as from her horse.

On the 18th of February, 1887, and in the environs of this infected house, the horse of a neighbor is seized with chronic tetanus, from which he will probably recover. Here, therefore, is the series :—

Infantile tetanus,	.	.	.	.	.	.	.	.	1st case.
“	“	.	.	.	.	.	.	.	2d “
Equine	“	.	.	.	.	.	.	.	3d “
Human	“	.	.	.	.	.	.	.	4th “
Equine	“	.	.	.	.	.	.	.	5th “

In fact, in this mixture of human and animal cases it can be admitted that the ones have alternately and successively infected the others.

To conclude this notice, however, it may be said that no just idea can be formed of these cases until Verneuil is heard from respecting those cases which appear to oppose or negative his theory

That man can be an agent of transmission¹⁵²_{Mar. 24} is not surprising, since the mode of etiology is the same for tetanus as for a number of contagious diseases. There may be a direct agent of contagion if he is attacked with the disease, indirect if he carries about with him or upon his instruments specific germs. In the latter instance man, to use the expression of Verneuil, is simply *tétanifère*. It is absolutely the same in whatever concerns the transmission of tetanus from horse to horse and from this animal to man. The latency of tetaniferous germs may thus give rise to the most extraordinary appearances.

Paul Berger¹⁵²_{June 21} thus expresses himself upon the transmissibility of traumatic tetanus from man to man: “Facts of this kind are of the highest importance,” says he, quoting Verneuil, “and would alone suffice to demonstrate the reality of my hypothesis. I acknowledge that entirely confirmatory observations are still rare, which arises from the fact that the question having hardly been

submitted, the replies have hardly had time to be furnished. It is to answer this appeal that Berger reports a double observation made by himself, on the one part, and Charles Nélaton, on the other, which appeared so unimpeachable, with a distinctness that hardly left place for doubt, on the transmissibility of traumatic tetanus from one wounded person to another.

The first case was one of tetanus occasioned by a burn upon the hand. The symptoms were distinct and urgent, and amputation of the forearm was done; but unavailingly, for the patient succumbed a week afterward, in eleven days from the onset.

The second case is the complement, and in some sort the continuation, of the first. It is of a young boy of eight years who had been run down by a fiacre and presented multiple contused wounds.

Nélaton had performed an ovariectomy with all antiseptic precautions on the 23d of January. After the operation Berger proposed a visit to a case of tetanus in his wards, and Berger, Nélaton and some others proceeded to the bedside. Nélaton sat on the edge of the bed, watched the undressing of the wound, and left without having touched the patient. Then was presented to him the little wounded boy who is the subject of this observation. Before the dressing he washed his hands, then again with sublimated water, and Plicque did likewise. The wound was partly dressed, and an externe left to complete the operation. It was not known, however, whether the latter took the precaution of washing his hands, or whether he touched the bed of the tetanic patient. However that be, seven days afterward, on the 31st of January, the little boy showed trismus, then lock-jaw, the sardonic grin and opisthotonos, but he eventually recovered.

The present fact is confirmatory of the opinions of Verneuil upon the equine origin of tetanus. The first of the tetanus patients, as reported by Berger, went every day after his wound to the stable to procure oats. Berger has collected as bearing upon this point etiological documents relative to six cases of traumatic tetanus which have so far come under his care. Few of these wounded persons, whether by the mode of production of the wound, their dwelling, or their habits, were, at the moment of the reception of their wounds or since that time, in relation with horses. In a fifth, contagion from man to man was probable. In the last there

was no connection with horses, but an undeniable telluric contact. These facts come to the aid of the doctrine of Verneuil; they seem to agree with the hypothesis of an infectious origin of tetanus, and two of them appear to indicate its transmissibility from man to man.

Pasarell, of Porto Rico,¹ has been led by independent investigations to conclusions in regard to the nature and etiology of tetanus in many respects quite identical with those which Verneuil, of Paris, expressed before the French Association for the Advancement of Sciences on the 21st of January. Pasarell's account of his conclusions was published in the form of a pamphlet in July, 1887, and his title to priority in the matter is maintained by Bétancés, of Paris. Moreover, it seems to be frankly recognized by Verneuil, in a letter to Bétancés, dated in March, 1888. Of course, there are opponents to the theories of Verneuil, and his views have not been received with acclamation by the profession; but certain it is that his adherents have recorded many very pointed and curious facts which bear favorably upon them. Besides those previously recorded, we reproduce two cases, probably coincidences, which are offered by T. B. Adam.⁶ He says that in a review of the more recent investigations into the pathology of tetanus Wm. Anderson states:⁶ "It is certain that although tetanus may be induced by the inoculation of a specific micro-organism or of a specific ptomaine, its occurrence as the result of direct transmission from one subject to another has yet to be demonstrated by clinical experience." As a note to the above statement Dr. Adam wishes to record the following cases: The first, Chas. S——, was admitted to the Foochow Native Hospital on September 28, 1887, suffering from a crushed toe. The toe, being gangrenous, was amputated; symptoms of tetanus appeared the following morning. The patient was removed to a little private room, carefully fed, and put on full doses of chloral and bromide of potassium; severe opisthotonos developed later, and death from exhaustion occurred on October 1st.

Case 2. Sin J——, aged thirty-one, was admitted to the hospital on October 8th, suffering from internal bleeding piles. On the 10th the piles were ligatured and the patient afterward placed in the little room in which the man, Chas. S——, had died ten days previously. Treatment was instituted and recovery was rapid and uninterrupted. Nine days after the operation, considering himself

well, the patient returned to his home, some three miles distant. On the following morning, October 20th, he reappeared at the hospital complaining of stiffness in the jaw and muscles of the back. . . . On the fifth day of his illness, however, influenced by some foolish friends, he took a gloomy view of his own case, gave up hope, refused nourishment, and died of exhaustion on October 26th.

The coincidence of the two cases is striking and strongly suggestive of contagion. Tetanus is not common in Southern China. In eight years of hospital practice Dr. Adam had met with one case only. Is it possible, says that gentleman, that the second patient was inoculated through the anal wound by dust containing specific micro-organisms generated by the first patient and tetanus produced? The necessity for the thorough cleansing of a ward in which a case of tetanus has occurred is, however, clearly indicated.

Richelot³_{Sept. 12} also gives two cases, "the second of which, certainly, is the consequence of the first, and both occurred at the Hôpital Tenon. In the first case tetanus followed an operation for ablation of the ovaries and Fallopian tubes, and was fatal. In the second the operation and consequences were still more simple than in the preceding case; but on the seventh day tetanus set in, and death ensued eight days afterward. The room in which all laparotomies were done had been well disinfected with sulphur and the walls washed with carbolic acid. "But," says the author, "I ought to mention that a fact struck me: from the 16th to 19th of June, 1888, twenty days before the first operation, a quantity of manure had been moved about the court of the hospital and spread out upon the flower-beds. Could there have been transmission by the people of the house to the patient, lodged in the third story?"

"To sum up, therefore," continues Richelot, "my two observations, compared with one another, seem to me to establish clearly, as so many other known facts, the infectious and contagious nature of tetanus."

More than a year ago it was asserted,⁵⁴_{Nov. 1, '87}⁹⁰_{Apr.} that both the infectious nature of tetanus and the nature of the agent producing it had been fairly established. In November, 1886, Rosenbach produced tetanus in two guinea-pigs by inserting under their skin a small portion of gangrenous material from the ulcer of an indi-

vidual suffering from tetanus. He also demonstrated for the first time the presence of bacilli capable of inducing tetanus. This solitary experiment of Rosenbach's, on which, until very lately, the pathology of tetanus in human beings rested, was confirmed by Bonome, and later still by Hochsinger, Vanni, and Giarre. During the year Bonome made wider observations on men, horses, and sheep, and—what was of greater value—studied minutely a small epidemic prevalent among a few persons wounded by a church that collapsed at Bujardo in the earthquake in Liguria on February 23, 1887. The patients were three in number, and in all three he discovered in the foetid secretion of the gangrenous wounds, amidst a host of micrococci, bacteria, and bacilli of various size and form, the constant presence of a “slender, bristle-like bacillus, easily stained with fuchsin, and motionless. It was twice or thrice as long as the bacillus of tubercle, and thicker and straighter, slightly rounded at the extremities, each of which terminated in a small swelling completely free from color, the bacillus thus resembling a pin.” In the blood, cerebro-spinal fluid, in the substance of the nerve-centres, in the nerve-sap, and in the lining of the intestines he found no bacilli. Inoculation with the fluid mentioned and attempts at culture in the various media had no result, but a watery solution of fresh pus containing the bacilli and of fluid from the tissues in the neighborhood of the wound produced tetanus when inserted beneath the skin or into the substance of a muscle. Inoculation directly into the blood never produced tetanus.

Bonome tried assiduously to get a pure cultivation of the bacillus, but failed, the bacillus of tetanus refusing to thrive unless in company with the germs of putrefaction. From all his experiments, he concludes, this fact emerges, that the exciting cause of tetanus, both in animals and in men, is a fine, bristle-shaped, pin-headed bacillus, identical with the bacillus of Nicolaïer.

In these views he was still further confirmed by later experiences. Seventy persons were injured by the fall of a church at Bujardo; of these nine were affected with tetanus, and all died but one; whilst in the great majority of those wounded in the earthquake in the Riviera there were no cases of tetanus, although many of the wounds were soiled by prolonged contact with lime-dust. Tetanus, then, can be produced directly by contact with the

dust of old buildings, and the fact completely accords with the experiments of Nicolaïer, who produced tetanus in animals by earth-dust.

Two cases are valuable in this connection. A horse fell on a dusty street and cut himself. The dust was allowed to adhere to the abraded wound, and in three days the animal died of tetanus.

In pus from the wound the bacillus of tetanus was found. A rabbit was inoculated with it and cultures obtained in which the bacillus developed itself. A ram, a few days after castration, suffered from severe general tetanus lasting three days. The pus from the wound was examined and experimented with, as in the case of the horse, with identical results.

By this showing, human tetanus, earth-dust tetanus, castration tetanus are one and the same, produced by the same germ—a small, bristle-like, pin-headed organism, existing in earth-dust and in the lime-dust of old buildings. In opposition³¹⁹_{July 14} to the results of Hochsinger, of Luigi Vanni, and Carlo Giarre, who found Rosenbach's bacillus in the blood of tetanic persons, Bonome, to whom these results were known only after concluding his work, could never discover the bacillus in the blood; he feels bound, however, to explain that he has so far only examined blood from corpses some time after death. Hochsinger,⁵⁴_{Feb. 1} however, in a somewhat recent communication, announces that he had the opportunity of examining a case of tetanus bacteriologically. The result of the investigation was, first of all, a confirmation of Rosenbach's statement as to tetanus-pus, and, secondly, the discovery of new facts, that the blood of tetanic men contains poisonous properties, and also the characteristic bacillus, or its spores developed from them; and it produces fatal tetanus in animals the subjects of experiment.

Höchsinger found by direct microscopical examination of the blood, like other investigators, no bacilli. He, however, collected in some sterilized serum blood drawn freshly from the veins of his patient. At the end of three days a whitish cloud was apparent in the water of condensation, and the microscopical examination revealed the fact that this turbidity was in relation with the presence of the bacilli described by Nicolaïer and Rosenbach.

Blood drawn by venesection, having been injected, killed a rabbit after twenty hours by tetanus. The blood of this animal

could not be effectually injected. Cultures were also not to be obtained. Injection of developed bacilli also killed rabbits with every appearance of tetanus after an incubation of from three to five days; and in this case, also, no bacilli could be developed in the blood of the dead animals.

The patient who had had tetanus was a digger, whose fatal disease was caused by an abrasion of the skin produced by a caving in of earth.

This appears to be of importance in view of the fact that Nicolaïer had produced experimental tetanus by inoculation with different sorts of earth, and has specially pointed out that soiling with earth is of etiological importance in the tetanus of human beings. It is also worthy of note that the pus collected at the surface of the wound contained the specific bacilli, and, as before stated, rabbits inoculated with cultures coming from this pus all succumbed to tetanus.

Giordano,⁵⁵ a pupil of Perroncito, prosecuted researches in a case of tetanus occurring in a man of forty years, in consequence of a fall from an elevated point. The immediate consequence of the accident was a complicated fracture of the forearm, with a rent in the skin. The superficial wound has a very bad aspect. Disinfection, then drainage. The fourth day the patient manifested the first symptoms of tetanus, and the fifth day he succumbed. Soon after death, Giordano extracted from the wound a little blood, a bit of the median nerve, and a fragment of a thrombosed vein. Everything was placed in sterilized bouillon. Inoculations made with particles of blood and of nervous substance, and with cultures derived from these same matters, gave negative results only. It was the same for inoculations made with particles of necrosed tissue, medulla oblongata, spleen, and with pus obtained from an erosion of the lips. On the contrary, pus extracted from a vascular sheath from the wound of the forearm and from a venous thrombus proceeding from the same, inoculated into rabbits and cobayas, excited tetanic symptoms. Inoculations were afterward made with particles of straw and of dust gathered at the spot where the fall happened, and with similar results. Pus which had formed upon the site of the inoculations contained, side by side with other microbes, a small number of bacilli presenting the same morphological characters as the bacilli of Rosenbach.

According to Giordano, the failure of inoculations done with material gathered in the superficial parts should be imputed to antiseptics placed in contact with the wound.

E. O. Shakespeare, ²⁹⁹ in a paper "Upon the Infectious Nature of Traumatic Tetanus," states that he desires to give, in this preliminary note, the first results of a long series of experiments still in the course of execution. He made some fifty inoculations by two methods, intercranial inoculations, after the manner of Pasteur, for rabies, and subcutaneous and intra-muscular injections. The inoculations were always done with every antiseptic precaution, and always with sterilized instruments. In none of these experiments did there happen any symptoms of accidental infection, such as suppuration, etc. The substance used in inoculation came in general from the bulb or the spinal marrow, and was cultivated in peptonized neutral, or slightly alkaline, solutions of glycerine-agar, so much extolled by Roux for the culture of the bacillus of tuberculosis.

The tetanus material was furnished by a horse and a mule which had died of traumatic tetanus in the veterinary department of the University of Pennsylvania. The brain, the bulb, and the spinal marrow were cultivated at from one to three hours after death and kept on ice until used. The material of inoculation was generally prepared in the following manner: A parcel of the bulb or of the marrow was finely pulverized in sterilized distilled water. After precipitation of the solid particles at the bottom of the vase the opalescent emulsion thus obtained was decanted by means of sterilized pipettes and placed in little sterilized vials, and was never kept in this manner for more than three hours before inoculation, and eight counter-experiments were made.

Shakespeare's personal researches led him to draw the following conclusions:—

1. Traumatic tetanus of the horse and of the mule is at least sometimes, if not always, an infectious disease transmissible to animals, and very probably to man. During the evolution of the affection a virus is developed and multiplies, which virus, injected into the cranial dura mater of another animal, produces the same infectious disease.

2. This virus is found in the bulb and in the spinal marrow of the animal which is bearer of the affection. Analogous to the

rabid virus, its virulence can be increased by subdural inoculation in series; like the rabid virus, it is susceptible of attenuation by desiccation in the air at a moderate temperature, and, like the rabid virus also, its effects are more intense when inoculated subdurally than when inoculated into the skin or in the muscles of the back.

He reserves his conclusions relative to the prophylaxis of inoculations of attenuated virus until his current experiments shall have been completed.

Comparing his experiments with those of Nicolaïer, Carle and Rattone, Rosenbach, Ferrari, Flügge, etc., he reaches these conclusions:—

Traumatic tetanus of animals and of man is, at least sometimes, if not constantly, an infectious specific affection due to the action of a specific infectious virus which exists in the tissues around the seat of the infection, in the blood, and in the central cerebro-spinal system.

Having furnished the experimental proofs, which are in possession, and the unattackable observations of many surgeons and veterinarians, the author believes that there is authority for admitting that tetanus observed in man is transmitted to him, directly or indirectly, by a domestic animal, *and in particular by the horse.*

Lampieri, of Trapani, ⁷⁰³_{Apr. 11} who decides altogether in favor of the bacillar theory of the disease, reports that a man who had died of spontaneous (?) tetanus and two mules affected with the same form of disease, and of which one recovered while the other died after twenty-seven hours, served to make cultures of the bacillus of tetanus. These cultures showed that this microbe appears in its complete development under the form of a bacillus two, three, or four μ long and one μ wide, rarely curved, or divided into small, cylindrical fragments. In sporification it is occasionally pisiform and of a granular aspect. The spore is a great elliptical cell with two short filiform caudal prolongations, visible upon dried preparations only.

On agar and gelatine the microbe forms whitish, rounded colonies, having somewhat the appearance of a drop of wax, and which turns yellow at the end of two or three months. Forty-five cabayas, seventeen rabbits, two lambs, and one sheep were

inoculated; twenty-seven of these animals had fatal tetanus, twelve a tetanus from which they recovered, and ten perished with an acute affection without tetanic manifestations.

To sum up :—

1. The micro-organism of tetanus is a specific bacillus, identical in form with that of man as well as of animals.

2. This bacillus is demonstrated very easily by the culture of blood in cases accidentally attacked or artificially inoculated.

3. Spontaneous tetanus is produced by the same organism as the experimental tetanus.

4. Traumatic tetanus is, in all probability, produced by the same micro-organism.

Beumer, of Greifswald, also believes in the identity of traumatic tetanus of man and tetanus developed by means of inoculation in animals. (Report of Professor Helferich, corresponding editor, Greifswald.)

With regard to *ptomaines*, we find that Brieger,²⁰_{v. 92, 11, 3} in mixing the cultures of the bacillus of Rosenbach with bouilli of sterilized meat, succeeded in isolating from the mass of a *ptomaine tetanin*, of which the formula is $(C^{13}H^{30}Az^2O^4)$. Hypodermically injected, this *ptomaine* produces in animals the same tetanic symptoms which Nicolaïer and Rosenbach observed in their experiments. Brieger also extracted from these same cultures two other poisons of great activity—tetanotoxyn and spasmotoxyn. The setting free of these toxic *ptomaines* was accompanied with a disengagement of sulphuretted hydrogen.

The researches of Flügge,⁹⁰_{Sept.} Nicolaïer, and others having proved that tetanus is produced by a bacillus, led to Brieger's experiment by which he succeeded in isolating a special *ptomaine* from cultivations of the tetanus bacillus. We now carry the subject a step farther by demonstrating the presence of this *ptomaine*—which he called *tetanin*—in the human subject during life. An injured arm of a tetanic patient was amputated; the soft parts were detached, finely divided, and then treated after Brieger's method for the isolation of *ptomaines*. The result was that a small quantity of an extremely soluble crystalline, double salt of platinum was obtained, which corresponded with tetanin-platinum chloride in percentage of platinum. The physiological action of the *ptomaine*, after the removal of the platinum, proved the presence of tetanine.

In reference to ptomaines, however, we have the statement of William Anderson,^{Feb. 4} that a study of the investigations of Nicolaïer, Hochsinger, Beumer, and Rosenbach will show that the results agree so far as to demonstrate that a disease which bears a close resemblance to human tetanus, but differs from it in some, if not in all, cases by the direct relation of the seat of the initial muscular spasms to the point of infection, may be conveyed to various animals by the inoculation of material derived from the tissues of tetanic men, horses, and mules, and that the complaint so induced may usually be transmitted in series to other animals. It is certain that although tetanus may be induced by the inoculation of a specific micro-organism or of a specific ptomaine, its occurrence as the result of direct transmission from one subject to another has yet to be demonstrated by clinical experience.

Trismus nascentium must be placed in the same category as tetanus. Beumer³¹⁹_{June} has found reason to believe that the tetanus of newly born children is due to a specific inoculation at the umbilicus by unclean hands or instruments. In a case of trismus he cut out a bit of peritoneum along with the cord and found the tetanus bacilli in abundance. With this secretion he inoculated several animals, which all died with the characteristic symptoms.

Among the curious cases recorded may be mentioned Verneuil's observation⁹¹_{Mar.} of a cataract operated by extraction in 1869 at the hospital of Porto Rico, where tetanus was very common. In spite of every precaution taken before and after the operation the patient was seized with tetanus after a violent storm, and died three days subsequently. Also a case of assumed tetanus¹⁹_{Jan. 14} from the use of the stomach-tube. It was decided to wash out the stomach for disease, and a tube was passed down the œsophagus. Hardly was this done before the patient became faint, and the instrument had to be removed. Two hours afterward his jaws stiffened, gradually all the muscles of his limbs and trunk became rigid, his temperature rose to 113° F., and he died cyanosed.

One single case may be added, interesting in itself, but referred to the "idiopathic" form of the disease. An inquest²_{Oct. 6} was recently held at Ringwood, Hants, on the body of a young man, aged twenty-five, who died after a short illness from idiopathic

tetanus. The occurrence of this rare form of disease and the diagnosis were extremely puzzling. The patient came of a hysterical family, and Dr. Geary Dyer, under whose care he was, although treating the case on the supposition that it was tetanus, was inclined to attribute the trismus, which was the only apparent symptom, to hysteria. This view was apparently confirmed by a temporary improvement, but the patient suddenly grew worse and died.

No post-mortem is recorded, but on the basis of Lampiasi's bacteriological investigations the conclusion is drawn that both "spontaneous" and traumatic tetanus are caused by the same organism.

Finally, in a very interesting report to the Academy by Verneuil upon a memoir by Berger on the transmission of tetanus from man to man, and on a memoir by Richelôt concerning the infectious nature of tetanus,¹⁰ the author, after reviewing the facts and cases presented, expresses himself in the following conclusions, which he thus introduces: "Having, then, previously very categorically affirmed the infectious nature of tetanus, I will rest satisfied in here offering to you some conclusions upon the transmissibility from man to man."

1. Interhuman transmission, which cannot be denied in principle, has so far been demonstrated by a small number of facts only.

2. This transmission does not seem to depend upon the air, but to act exclusively by direct or indirect contact.

3. The first mode, "immediate contagion," has not as yet been established by any decisive fact. The second mode, "mediate contagion," rests, on the contrary, upon quite numerous observations.

4. It is sometimes very difficult to discover the true agent of transmission among the numerous and varied intermediaries graduated between the first tetanic patient and those following.

5. This research should be followed up with determination, for it alone will teach us to hinder a mode of extension of the disease, rare, perhaps, but entirely beyond discussion.

The views expressed and the conclusions arrived at were discussed at a later meeting of the Academy by Guérin.¹⁰ He says: "I have listened to him with the greatest attention. In

his report the infectious nature and the transmissibility of the disease, which modern labors tend to prove, are admitted without reserve. This prudence of our colleague, as shown in his second, third, and fourth conclusions, contrasts strikingly with the boldness which he exhibited in affirming that tetanus has an exclusively equine origin. And allow me to add to his four conclusions a proposition which is in his mind:—

“Tetanus is inoculable. But what are the agents with which inoculation is done? In this matter all is doubt and uncertainty. The words of those who believe that they have isolated infectious microbes leave us in the greatest doubt. What is not demonstrated is that the agents of transmission are not micro-organisms. Observe, I do not deny, I only say that the demonstration has not been made. I might be disposed to believe that tetanus is engendered by a poison analogous to curare or to the toxine of Brieger, or to something like the virus of the anatomical puncture. This seems more satisfactory to my mind than the micro-organisms, against which the cotton dressing and the dressing of Lister are powerless. The lesion is an acute localized myelitis.”

Cures.—The extreme fatality of acute traumatic tetanus has called very many remedial agents into the field. Thus, in a case of Edmund Owen at St. Mary's Hospital,^{6 Apr.} of severe acute tetanus, the best possible result was obtained by the use of morphia in large quantities. The man was kept constantly under the toxic effect of morphia, given subcutaneously.

A case,^{2 May} of acute traumatic tetanus successfully treated by large doses of salicin and bromide of potash, is reported by W. E. Thurlow Prior, of Loddon, Norfolk.

A case^{100 May 17} of cure of tetanus by metallothérapie, is reported by Dr. Gueit.

A case of tetanus induced by a burn under the finger-nail produced by phosphorus was reported by Dr. Julio Cardoso, of Braga.^{129 Apr.} He claims a cure, having prescribed bromated camphor, hyoscyamine, aconitine, and veratrine, all given in syrup of chloral, and employed a descending current of electricity down the spine four times a day. Arseniate of strychnia was subsequently added.

A case of traumatic tetanus^{6 Aug.} with recovery occurred at the Burton Infirmary, service of Dr. Belcher. The treatment was salicylate of soda, twenty grains (1.3 grammes), every two hours.

Then one-sixth of a grain (0.011 gramme) of physostigma every hour, increased to nine grains (0.58 gramme) in every twenty-four hours, diminished to two grains (0.13 gramme) every hour, and gradually abandoned.

Brunauer⁸⁰_{Mar. 16} reports a case of traumatic tetanus cured by hypodermic injections of one-third of a grain (0.022 gramme) of pilocarpine daily, after hypodermic injections of morphia, and the use of quinine, iodine, and salicylic acid.

Frank Billings, of Chicago,¹³⁹_{July} gives the history of three cases of tetanus cured. The first, after nerve stretching, was treated with hypodermic injections of physostigma. He recovered, but did not regain his strength of mind.

The second case was one of simple fracture of the tibia. In two weeks trismus suddenly developed after a chill. Suppuration occurring at the seat of fracture, the fracture was made a compound one and thoroughly drained.

The third case was of a boy who received a crushing injury of one leg. Amputation was done at the upper third. On the seventh day he was taken with a chill and trismus commenced, followed by tetanus. The sciatic nerve was stretched, and recovery followed.

Tetanus was cured by Lopez,⁹_{Jan. 28} who used hypodermic injections of morphia and cocaine, 5 per cent. each.

In a case of tetanus W. J. Clapp, of Cardiff,⁶_{July 21} after unsuccessful treatment with "large doses of bromide of potash and hyoscyamus," exhibited strophanthus in "tabloids of two minims each," every three hours, with such success that the symptoms abated at once, and the patient was able to walk and take his food in a fortnight afterward.

Under the influence of bromide of coniine a case of traumatic tetanus was greatly relieved, indeed conquered, by Demme,⁸⁰_{May 15} for after thirty-four hours of treatment the symptoms disappeared entirely, and in a week after admittance the patient, a boy, was discharged as cured. The doses used were one-sixth of a grain (0.011 gramme) hypodermically once only, and one-twelfth of a grain (0.0055 gramme) every two hours internally.

He was not so successful in another case,⁹_{Sept. 3} also of a boy, whose respiration suffered greatly from the remedy, and death occurred on the fourth day.

In this connection it is of interest to note that in the year 1869 I treated ⁵_{July, 70} four cases of traumatic tetanus with conia, employing it hypodermically, even to two drops every hour, and with the result of saving two patients out of four. In another, a case of traumatic tetanus produced by a large splinter entering the buttock of a young man (April 13, 1860). Many remedies were vainly employed by Dr. John O'Donovan, of Baltimore, until ten days afterward the inspissated extract of cannabis indica was exhibited in doses increasing from one-fourth of a grain to one drachm (0.016 to 3.89 grammes) within the half hour. Then the cannabis was continued in doses of eighteen grains (1.17 grammes) every half hour until relieved on the 6th of May, when fourteen hundred and thirty-seven grains (93 grammes) had been administered. From May 1st to May 4th seven hundred and ninety grains (51 grammes) had been exhibited.

SEPTIC FEVER, SUPPURATIONS, ETC.

From traumatic fever to septic fever the way is easy and leads as well to puerperal fever, "for I take it," says Dr. Playfair, ¹⁴³_{Jan.} "to be now almost universally admitted that puerperal septicæmia is practically the same as surgical septicæmia, a disease caused by a poison absorbed through the genital tract into the system, which poison may either originate *de novo* or be conveyed to the patient from without by septic matter being brought into contact with her." Some believe that the poison is sepsin; others that the true cause is bacteria; while others maintain that bacteria are only the carriers of sepsin. Certain pathologists believe that it may be communicated through the air, especially of foul surgical stations or lying-in institutions, or that it may originate *de novo* in putrefying surgical wounds, or in the genital tract of parturient women, or hold that it is always contagious and has its origin in a something that comes from a like disease.

Traumatic fever, according to F. Verchère, ¹⁰⁰_{May 5} is that fever which happens after traumatism, and its characteristic is that it appears on the third or fourth day after the accident or the surgical intervention. But this typical traumatic fever may not always present this special character, and in certain conditions it may come on the very evening of the accident or the very evening of the operation. To this variety of traumatic fever Verneuil and his pupils,

Maunoury and Jeannel, have given the name of fever of inoculation.

A first theory regards traumatic fever as only a nervous reactionary phenomenon; a second and highly popular theory regards every traumatic fever as having been produced by the introduction into the organism of a strange, pyrogenous element. Nevertheless, attention must be given to those cases of perfect, complete union by first intention, in spite of which traumatic fever has appeared. Actually, and this is the view of Verchère, the dominant opinion attributes the pyrogenous activity of the primitive secretions, and consequently of the extravasated blood and lymph, especially, to a matter found by A. Schmidt, and which he has called *fibrin ferment* which has the property of coagulating the blood. It is not found free in the circulating blood, but it forms in stagnant and extravasated blood; still, we must not forget that the normal liquids of the organism, placed in particular conditions, can give rise to this pyrogenous product, the fibrin ferment of Schmidt.

The matter of the introduction of a poison, however produced, into the body is a fact of great importance; it may occur everywhere and at all times, and we now have reason to believe that it can be prevented in the great majority of instances. This is septicæmia. Every lesion of the abdomen,⁹¹ accidental or surgical, with or without intestinal lesion, may be accompanied with early, characteristic, constant symptoms, which constitute intestino-peritoneal septicæmia. That the pyogenic organisms, says W. Watson Cheyne,² are essential for the production of these diseases as they occur naturally there can no longer be any doubt; but in many cases much depends on other conditions, of which the chief, probably, are the dose and number of the organisms and their concentration, general and local depression of vitality, and the seat of inoculation. If the organisms enter in large numbers, sufficient to overcome the resistance of the body, they alone may cause the disease; frequently, however, they enter in smaller numbers, and then other conditions become necessary to enable them to act. Of these conditions the chief are, depressed vitality—either local or general—combined with the possibility of their remaining in the weakened tissue. This depression may be brought about by conditions acting on the body generally, such as

acute fevers, or by local conditions, more especially those which induce the early stage of inflammation, such as cold, injury, chemical substances, the products of the bacteria themselves or the products of other kinds of bacteria which may happen to be growing with them. Or, again, the favorable condition may be some peculiarity in the soil as shown by variations in the character of the disease in accordance with the seat of the inoculation and the anatomical arrangement of the part. The only factors, however, with which we can reckon with certainty are the cocci themselves.

L. D. Hill,¹⁴³ of Texas, expressing himself to the same point, believes that to develop septic poison in the system or for it to be absorbed, when generated out of it, there must be a pathological state of the blood and tissues not fully understood. So also Tricomi,¹⁷_{Apr. 20} who says it can, therefore, be admitted that in the microbic septicæmic affection a pre-existing change is necessary for the production of metastatic abscesses, and that, on the other hand, the pathogenic microbes are eliminated.

In cryptogenetic septic pyæmia, however, Jürgensen⁸_{Apr. 18} found nothing but staphylococcus pyogenes aureus and streptococcus, and it appeared to him that streptococcus was disposed rather to develop local phenomena, whereas, staphylococcus circulated with the blood and produces disseminated foci. At the autopsy these two micro-organisms were always met with, but their existence was not established during life.

Of late years it is tacitly admitted¹⁴⁵_{Oct. 27} that suppuration, phlegmons and abscesses are always due to the intervention of the micro-organisms which surround us; notably, since the remarkable work of Strauss, general opinion, especially that of surgeons, accepted as an axiom that there is no suppuration without a microbe. Strauss experimented upon rabbits with irritating substances containing no microbes with but little success; he succeeded, however, with dogs. Hugo Marcus did experiments with nitrate of mercury, carbolic acid, and corrosive sublimate, employing sealed tubes which after three or four weeks were broken under the skin. Abscesses resulted in due course, but no micro-organism whatever was developed. The same substances injected into man's body produce the same effects; therefore the author concludes that in the face of these results he can hardly admit that suppuration necessarily

owes its origin to a specific microbe, and in this he quite agrees with Rosenbach and others. Hugo Marcus assumed it to be well-known that even in the cases wherein the microbe is the cause of pathological processes it acts, not directly, but always through the medium of nitrogenous matters, generally called *ptomaines*, some of which, as cadaverin, can be produced by purely chemical methods. Why Strauss succeeded with dogs and failed with rabbits is one of those questions of soil so ably treated by Verneuil in the preface to Paget's book.

Besser, of St. Petersburg, ⁴¹_{Sept. 24} made many cultures with blood and pus from the living subject, as well as from the dead, with the view of determining which of several microbes ought to be regarded as the cause of pyæmia and septicæmia. He satisfied himself that pyæmia is the result of an invasion of microbes, and can be produced as well by staphylococcus as streptococcus, which are identical with those met with in abscesses. With regard to septicæmia, Besser found streptococci in twenty-two cases of traumatic origin, and from his investigations he concludes that streptococcus alone can be the cause of septicæmia.

Doyen ¹⁰⁷_{Feb.} draws the following conclusions from the study of numerous cases of suppuration and septicæmia: The pus of acute abscesses always contains one of the four pyogenic microbes of Rosenbach. The microbes may penetrate the tissues at the same time and produce suppuration, and the pus may contain one or two species of microbes simultaneously. The penetration of the microbes into the tissues always precedes the appearance of the general and local phenomena. If an abscess be incised at the beginning microbes are constantly found in the blood, in the plastic lymph, and in the section of the inflamed tissue wherein the initiated cells undergo proliferation. The streptococcus and the staphylococcus are to be met with in acute suppurations and septicæmia, and these have been verified by cultures and in sections.

In the address of F. Hueppe, of Weisbaden, ¹⁰⁸⁰ occurs the following conclusion with regard to a fundamental basis of modern medicine—that “the excitants of infectious disease must be specific organisms, and the specificity may be either absolute or else evolved during thousands of years from local putrefactive processes.” Now, seeing what modifications can be produced in

bacilli by experimental cultivations, it seems unnecessary for Dr. Hueppe to postulate such long periods of time. I may be told that this is the pathology of the pre-Darwinian and pre-bacteriological era, but that does not prove it to be erroneous. Dr. Hueppe, faithful to his convictions, thus closes his address: "Putrefactive processes are necessary as an intermediate stage between plant life and animal life, and so long as these processes go on, so long will organisms exist which, owing to their very origin, will act detrimentally on the structures of the human body, that is, will excite disease."

It is thus that Dr. Hueppe endeavors to harmonize with "the idea of Koch, namely, that infection may occur by a plurality of modes."

To follow out the etiology of suppuration we now refer to the paper of Fehleisen.^{228 336} Bd. 36, H. 4; Sept. 1 Partly upon his own grounds, and partly, also, upon those of foreign investigation, he gives expression to those circumstances under which the pus-bacteria, inoculated in small quantities, and then commonly perishing or being quickly thrown off, show really pathological properties; and, moreover, the varieties which appear in the symptoms according to the place of infection.

In testing this question he comes to the conclusion that the virulence of the pus varies according to its origin. In general he received the impression "that pus is so much the more virulent as the inflammatory symptoms it produces in the individual in which it takes its origin are severe."

On the other hand, the number of the bacteria contained in pus has nothing to do with its virulence. The investigation which the author undertook in order to isolate those component parts of the pus which, in the presence of the micrococci capable of self-propagation, produce its virulence, were infructuous.

Roswell Park⁹ Dec. 1 thus puts himself on record: "Phlegmonous inflammations caused by streptococci are either of the nature of true erysipelas when caused by its specific streptococcus, or take the form of a diffuse cellulitis, in which, if pus forms, it does so more slowly. The phlegmons caused by the staphylococcus are usually localized even if extensive, whereas those in which the streptococcus is found are quite likely to be connected with multiple or somewhat distant abscess formations. With regard to

their powers of systemic poisoning there is, perhaps, but little difference; both may alike cause septicæmia and pyæmia—through the action of septic phlebitis and the dispersion of septic thrombi, or through a poisoning of the system by ptomaines. Nevertheless, when a systemic infection is caused by streptococci, the abscesses seem to be confined rather to the serous membranes; when this systemic infection is caused by staphylococcus we see during the active period of growth—that is, during adolescence—that there is a tendency to inoculation of the pyæmic process in bone, and then we have clinical manifestations of acute infectious osteomyelitis.”

CADAVERIN.

John L. Hatch,¹¹² in a prize inaugural thesis entitled “Experimental Observations upon the Nature of Cadaveric Poisoning,” arrived at conclusions of which we reproduce the following:—

1. All the juices and tissues of the cadaver contain a poison, which is more or less virulent when inoculated into a living animal.

2. The virulence of cadaveric poison is not directly inherent in bacteria, but depends upon chemical poison, the ptomaines.

3. Pure cultures of a non-pathogenic bacterium, when inoculated into a healthful animal, do not produce cadaveric poisoning. Impure cultures and bacterium masses containing ptomaines are of a toxic nature.

4. Cadaver poisoning, when acute, is nothing but one of the forms of septicæmia; but when chronic it is a peculiar specific disease, characterized by definite anatomical lesions analogous to those of the specific inflammations (syphilis, tubercle, lepra, glanders, anthrax, etc.), but not identical with any of these; consequently it represents a peculiar and independent affection that may properly be termed *cadaverosis*.

Another side of the subject is treated by Behring⁶⁹ in a recent paper upon cadaverin, iodoform, and suppuration, and supplementary to a former one⁶⁹ which has been referred to by Grawitz in his work “On the Importance of Cadaverin in the Origin of Pus.”

The following propositions have reference chiefly to cadaverin and iodoform:—

1. Cadaverin can produce pus without the co-operation of micro-organisms.

2. Cadaverin and iodoform affect each other in such a manner that both substances undergo chemical transformation.

3. Through the chemical effect of iodoform upon cadaverin the latter loses its pus-producing power.

4. With the example of cadaverin we can perceive how iodoform may hinder suppuration without exerting a disinfecting influence or arrest of development upon pus-bacteria.

The experiments of Grawitz²⁰_{v.10,H.1,97} on the significance of cadaverin in the production of suppuration are also not without interest. As a part of his results we may mention that cadaverin belongs to those alkaloids of putrefaction which, even in the smallest quantity, destroy the nutritive qualities of cultivation media for other bacteria. The producers of cadaverin must, in consequence, be looked upon as antagonistic to the staphylococcus aureus. In another set of experiments Grawitz made subcutaneous injections of the cadaverin solution containing the staphylococcus aureus or the streptococcus, with the result of producing a severe phlegmon in the surrounding tissues, followed by necrosis of the skin. The pus from this phlegmon was found to contain, in addition to various other cocci, those which had been contained in the solution.

From these experiments it follows that cadaverine has the property of setting up suppurative inflammation, and that in cases where living pus-cocci are present these cocci increase the suppuration and cause it to extend to the neighboring tissues. Of all chemical compounds the alkaloid seems most to resemble ammonia in its local action.

BLUE PUS.

P. von Ernst³¹⁹_{M.} makes a communication upon "a new bacillus of blue pus (bacillus pyocyaneus), a variety of the bacillus pyocyaneus of the author.

In four cases of blue pus observed in the Heidelberg Surgical Clinic, the author found a bacillus which, in its various forms of growth, displays altogether constant and characteristic peculiarities in contrast with the bacillus pyocyaneus, hitherto alone recognized and described. Gelatine is more rapidly liquefied by the new bacillus, while the spreading of the coloration and even the color tone of the pigment produced is different. Agar, bouillon, and potato cultures presented characteristic, distinctive features in the manner

of growth and the behavior of the pigment in the presence of atmospheric oxygen, in regard to which the author's original work must be referred to. The author was unable to undertake chemical examination of the pigment, but, according to his observations, he believes that it is not identical with pyocyamin. In conclusion, the author lays emphasis on the fact that even in long-continued cultures no transition form could ever be produced in the newly discovered bacillus, which he regards as a variety of bacillus pyocyaneus. He finds in this behavior an evidence against Naegli's theory as to the capacity for change in the chink-fungus (spaltpilze).

G. Ledderhose,³⁰¹¹³_{Bd. 23, H. 3, Sept. 15} in an article upon blue pus, referring to von Ernst, said this author showed that not one bacillus alone, as had been previously supposed, was the exciter of blue pus, but that two varieties occur which he distinguishes as bacillus pyocyaneus α and β . Ledderhose experimented with both bacilli. The most important distinction between the two varieties (which morphologically agree perfectly), consists in the fact that only bacillus β produce the blue coloring matter, pyocyanin, while bacillus α produces a yellowish-green coloring matter decidedly fluorescent. He therefore proposes to distinguish the two varieties as bacillus pyocyaneus and bacillus pyofluorescens.

As to the pathological properties of the blue-pus bacilli, Ledderhose found that they produced inflammations which were either acute and deadly, or subacute, or, finally, chronically suppurative. In all cases the injected bacilli could be shown in the inflamed tissues, either microscopically or by culture, without admixture of other bacilli. Pyocyanin appeared to show no toxic properties.

Ferrari¹⁷_{April 26} has studied the microbe of blue pus, not in an innocent form of suppuration, but in a case of septic infection; and, contrary to the opinion of many bacteriologists, who are of opinion that the *bacillus pyocyanicus* provokes neither death nor even suppuration in animals, he has demonstrated that its injection into the peritoneum of rabbits always caused death, whether by sero-hæmorrhagic peritonitis, sero-fibrinous, or purely fibrinous, when the quantity is considerable, or else by purulent peritonitis in eight or ten days, when this quantity is small. But Lampiasi avers that the clinical facts are not in accord with the experience of Ferrari.

At the session of the Academy of Sciences, January 30th, Pasteur⁵⁴_{April 15} presented to that body the first annual volume for 1887 of the *Annales de l'Institut Pasteur*. He embraced this opportunity to call special attention to the investigations of Roux and Chamberland published therein in the December number of 1887, and bearing the title, "Immunity against Septicæmia Conferred by Soluble Substances." Both investigators had discovered the important fact that protection against malignant œdema can be attained by inoculation, with the help of previous injections with sterilized culture-fluids. The fact of an immunity obtained through soluble substances, through products of tissue change, is, according to Pasteur, "*d'une importance capitale*" (of capital importance). This fact is altogether new, and the credit of it belongs to this Institute, so that he proudly concludes: "*Ma joie est grande d'avoir pu être témoin de ce nouveau progrès réalisé dans mon laboratoire*" ("My joy is great at having been able to witness this new progress realized in my laboratory").

Unfortunately, however, Pasteur, and many others with him, are historically in error, inasmuch as the fact of immunity through sterilized products of tissue change, through chemical soluble material, has been known in the literature of the subject for two years.

Hueppe,⁵⁴_{Apr. 16} in a most interesting paper, reviews the whole history of the subject, and most especially endeavors to show that the results obtained by Salmon and Smith, in their experiments on pigeons with hog-cholera bacilli,⁵⁴_{Feb. 20, '86} anticipated by two years the discoveries which Pasteur claims for his Institute.

Both observers, Roux and Chamberland,⁵⁴_{July} after various experiments with bouillon, cultivated bacilli of so-called malignant œdema in that substance, killed the bacilli by exposing the fluid for ten minutes to a temperature of from 105° C. to 110° C. (221° to 230° F.), and injected forty cubic centimetres into the abdominal cavity of guinea-pigs three several times at daily intervals. Two days later the guinea-pigs received a virulent culture under the skin; they remained alive, while the animals of counter-proof died in eighteen hours. And the immunity lasted the longer as a greater quantity of the bouillon had been injected—even to thirty days.

Roux and Chamberland have, therefore, isolated these soluble

products, and, by carefully injecting them into guinea-pigs, have made these animals incapable of being affected by the septic vibrio.

A. D. Pavlowsky, of St. Petersburg, ¹⁴_{Feb. 29} has produced a series of experimental researches upon the pathogeny of acute peritonitis. He injected into the peritoneal cavity of dogs and rabbits different substances, as croton-oil, tripsin, cultures of microbes pathogenic and non-pathogenic, the contents of the small intestine, and studied the effects. Croton-oil and tripsin produced always a hæmorrhagic peritonitis and the exudation contained no microbes. Injections of cultures of non-pathogenic microbes (yellow sarcina, etc.) gave also a negative result. But staphylococcus aureus injected into the peritoneal cavity, even in very minute quantity, always provoked a purulent peritonitis, and was found again in the exudation, the lymphatic reservoirs of the tendinous centre of the diaphragm, and even in the spleen. The bacillus of blue pus (bacillus pyocyaneus) produces absolutely analogous effects.

In a last series of experiments Pavlowsky injected into the peritoneal cavity the contents of the small intestine either in a natural state or previously filtered and sterilized. In the last case the effect of the injections was *nil* ; but in the first case the animals perished with a fibrino-purulent peritonitis. The exudation contained a great number of peculiar bacilli, immovable and short, which, planted upon agar, gave rise to colonies of a grayish and oily reflexion which did not liquefy gelatine. Then pure cultures injected into the cavity of the peritoneum always excited fibrino-purulent peritonitis. The microbe in question ought, therefore, to play an important part in peritonitis by intestinal perforation.

At a still later date Th. Leber, of Göttingen, ⁵⁴_{1884, No. 12}; ¹⁰¹_{Oct.} communicates some exceedingly interesting investigations which throw new light upon the etiology of the inflammatory process. As early as 1881 he had been of the opinion that inflammations may be produced by pure chemical substances, especially copper and mercury. Micro-organisms which have been killed by heat are still capable of exciting purulent inflammations, and may contain substances which act in this manner. Thus, the injection into the anterior chamber of the eye of masses of staphylococcus aureus sterilized by long cooking gave rise to very intense purulent inflammation.

This differed, however, from the inflammation produced by the injection of living staphylococci in that it showed no tendency to advance, and, even when of an intense grade, subsided rapidly. The dry residue of a watery extract of the staphylococcus, which contained no cocci, and the residue of alcoholic extracts provoked purulent inflammation. Leber succeeded in extracting from these staphylococci a crystalline substance which has the property of producing intense inflammation and necrosis, even to a greater extent than the cocci themselves. He has named this substance *phlogoscin*. It is readily soluble in alcohol and ether, less soluble in water, and crystallizes in clusters of fine needles. The presence of carbon dioxide could not be demonstrated by Lassaigne's test; and there seems to be no chemical affinity between Leber's phlogoscin and the ptomaine derived by Brieger from the staphylococcus.

GANGRENE.

Ch. Cornevin²¹¹_{Apr. 22} brings forward the experimental researches which he has made upon gangrene foudroyante. Employing gangrenous matter taken from man and applied to the lower animals, as Chauveau and Arloing had done previously, he showed great differences in the sensibility of animals to this virus. At the head of the scale, as to readiness of acceptance, must be placed the cabaya and the ass. The "receptivity" of the ass is extreme, and gangrene explodes in it with great facility. To inoculate this animal an excessively attenuated virus must be employed. At the foot of the scale, and among those showing the most resistance to the effects of inoculation, are to be placed the cat and the duck. Cornevin has sought to modify the virus of this disease by passing it through different animals, and he chose the cabaya and the white rat for his experiments. He found that the poison which passed from cabaya to cabaya, after any number of generations, killed all the animals named in a prepared list, but that the results are different if the white rat, adult or aged, be employed. After the seventh generation the virus kills all the cabayas inoculated with it, destroys a part only of pigeons and rabbits, and respects the duck, the cat, and the dog. We are, therefore, justified in concluding that the passage through a series of white rats attenuates the virulence of the microbe of gangrene foudroyante.

He concludes that the virus is a septic vibrio which is miti-

gated by the combined action of heat and various chemicals, as the phenols, and that this modified virus grants immunity from the strong, but only for twenty-three days, or with fowls fourteen days, or the dog eighteen days. The microbe of gangrene foudroyante is very abundant in the earth, even in that of the fields; but the earth in forests seems to be free from it, and it is not found in the air; but by the addition of lactic acid attenuated virus recovers its virulence.

Finally, the idea of the identity of gangrene foudroyante of men and animals with the septicæmia produced by the septic vibrio receives, according to the author, a new and solid support from the experiments he has conducted.

H. Radziszewski, of Cicchanowiec, ⁷³_{July 21} accompanies an observation of spontaneous symmetrical gangrene of the fingers with some interesting remarks. Cases of spontaneous gangrene, according to this author, are relatively rather rare, and proceed from different causes, of which the multiplicity has served to distinguish among them several clinical varieties, as follows:—

Senile gangrene, attacking less frequently the fingers than the toes, and even the plantar surface of the latter. This variety, sometimes dry, sometimes moist, is met with in aged persons, with circulation trammelled by arterio-scleroses or other pathological processes proper to old age.

Gangrenous ergotism, attacking indifferently the superior and the inferior extremities.

Symmetrical gangrene of the extremities (Raynaud), a variety very seldom observed in anæmic persons and particularly in women, and which attacks the fingers, the end of the nose, and the cartilages of the ears.

In the symptomatology of diabetes the gangrenous phenomena occupy an important place, and in these cases all the forms of gangrene, dry, moist, etc., are encountered.

Gangrenous ergotism and the symmetrical gangrene of Raynaud are usually referred to as resulting from spasm of the vessels and from the enfeebled action for the heart. Without, however, wishing to invalidate the importance of the diminished activity of the heart or of the alterations proper to diabetes in the evolution of gangrene, the author entertains a doubt as to these being the principal causes of gangrene in the case in question. The

symmetrical appearance of gangrene and the considerable pains of a neuralgic character which had preceded it confirm the important part assumed by the nervous system in the evolution of the malady.

The case was as follows: Male patient of fifty-seven years, not having had of late years any grave disease, and no trace of syphilis; a great imbibor of brandy. From time to time his legs swelled so as to impede locomotion; at present, however, no œdema, which, by the way, never appeared in the face. Micturition frequent, especially in the night, when he is obliged to rise almost every hour. The patient claims never to have had giddiness, headache, vomitings, or impairment in the use of the extremities; he also denies having suffered with ardent thirst. In the spring—that is, several months ago—he felt in his hands for the first time pains, which, to use his own expression, “seized his heart and prevented him from sleeping by forcing him to sit up.” A symmetrical gangrene of the fingers of both hands was the consequence of this condition. Sensibility had increased anteriorly to a distressing degree; to the touch “the fingers hurt him as if they were riddled with abscesses;” no pains in limbs. The patient often complained of insomnia, but his pains were endurable.

In this patient gangrene of the extremities appeared symmetrically, attacking the third phalanges of the fingers (excepting the thumbs); it developed readily by the aid of alcoholism, advanced age, of albuminuria, and of diabetes. Each one of these diatheses sufficing, after the researches of Verneuil, to provoke a spontaneous gangrene, the author was unable to determine the first cause in his patient; besides, it was found almost impossible to refer this observation to this or that rigorously defined clinical form. But it would appear, for all that, in placing in parallel lines the data of science and the facts observed in this patient, the admission would be plainly authorized of attributing the local alteration of the vessels in the tissues, followed by gangrene, not only to an abnormal composition of the blood, but also, and in great part, to the influence of the trophic nerves, of a tropho-neurosis.

It is greatly to be regretted that cases of diabetic gangrene are not more frequently reported; statistics would, indeed, be very desirable, and they might possibly agree with the statement of

William Hunt,⁹ that he "should not be surprised to find, after thorough investigation, that in *numbers*, in civil practice, diabetic gangrenes would be found to hold the second place, traumatic gangrenes, including those from frost-bite, burns, and scalds, only exceeding them."

SURGERY OF THE LUNGS.

By JULIUS DOLLINGER, M.D.,

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HIPPOCRATES' doctrine with regard to the treatment of certain pulmonary diseases attracts at the present time the attention of the whole medical world. This great philosopher, writing of abscesses located within and without the lung-tissue, describes precisely the proper point at which to open them, tells us how to drain and cleanse the cavities, and even mentions the proper instruments. Two thousand years have elapsed, and to-day we follow out the principles as laid down by the father of medicine. The originators of the successfully established surgical treatment for distinctly defined diseases of the lungs at present are Létiévant and Estlander. Létiévant proposed an operation for empyema; Estlander was the first one who practiced and described the same, under the name of thoracoplasty, about ten years ago. Since then the operation has been the standard one and has been adopted by many surgeons. John B. Roberts, of Philadelphia, in his valuable consideration on the "Surgical Treatment of Pericardial Effusions," has certainly stimulated and encouraged to greater activity operators who give their attention to thoracentesis. Clinical observations, conducted by able men in the profession, placing reliable statistics at our disposition, have contributed largely to the improvement and progress in the field of surgery of the lungs.

Antisepsis.—Before going into the details of the subject before us, it is hardly necessary to dwell at any length on the importance of strict antiseptic laws. Surgery without them has gone by. G. T. Robertson, ⁹⁰ in a paper upon the "Surgical Treatment of Empyema," says that "there can be no doubt that the successful treatment of empyema dates from the introduction of the antiseptic system."

Diagnosis.—Absolute dullness on percussion, the absence of respiratory sounds, and the destruction of vocal fremitus, the physical signs which indicate the presence of fluid, are not sufficient

to make a diagnosis with certainty. To confirm the diagnosis and ascertain the character of the fluid, an exploring needle should be made use of. The sooner this method is employed the better for the patient, for if we wait we favor the purulent transformation of a serous fluid; furthermore, the lung is pressed against the vertebral column, losing its resiliency and power of expansion, the chest-wall becomes hampered in its movements by paralysis of its muscles, and thus two valuable auxiliaries to the complete removal of the fluid will have been lost.

Different Methods of Operating.—Steele,⁶¹ speaking of the subject at the thirty-ninth annual meeting of the American Medical Association, gives the following choice of operations, stating at the same time that no absolute rule can be laid down for the management of all cases: (1) aspiration; (2) aspiration and washing out of the cavity with an antiseptic solution; (3) thoracentesis with trocar and cannula; (4) thoracentesis with subsequent drainage; (5) simple incision; (6) simple incision and drainage; (7) simple incision with through and through drainage, with or without antiseptic precautions; (8) subperiosteal resection of rib and drainage; (9) thoracoplasty, Estlander's operation; (10) perflation.

Practically we may confine ourselves to the relative merits of but two of these methods—aspiration and free incision with drainage.

Line of Incision.—White and Bruen,⁵ summarize in a paper published in 1884 the following rules:—

1. The portion of the ribs removed should be those between their angles and their sternal attachments. Posterior to this they are less movable, and are so close together that the difficulties of the operation are greatly increased.
2. Those ribs between the third and tenth should be selected which accurately overlie the cavity.
3. The number of ribs operated upon should be proportionate to the depth of the cavity.
4. The length of the pieces excised should be proportionate to the depth of the cavity.
5. The operation should be done aseptically and subperiosteally, and when so performed is almost without danger, and, even in cases where large portions of ribs are removed, is followed by no permanent loss of function in the external respiratory muscles of that side.

Indications and Contra-Indications for Operating.—Bouilly, of Paris,⁹¹ who has contributed largely to the literature of this subject,

divides the cases into five classes in which surgical interference is to be considered: 1. Large cavities in which the lung, fastened to the vertebral column by thick false membrane, is entirely and permanently collapsed. In these cases the operation is useless and dangerous. 2. Large cavities in which the lung, though condensed, still preserves a slight vesicular murmur. Intervention is then sometimes useful, particularly in young patients and when the cavity does not extend beyond the third rib. 3. Cavities from eight to twelve centimetres in diameter; these present the most favorable conditions for cure. 4. Simply fistulous tracts of greater or less length; if short and straight, the results will probably be good; the prognosis becomes less favorable when the fistulæ are long and tortuous. 5. Cases in which there are moderate-sized cavities with fistulous tracts communicating with them; in these the prognosis is favorable.

It may be added that in advanced tubercular cases the operation is contra-indicated, and on this consideration Fräntzel¹³_{Aug. 15} has written an elaborate paper.

Dangers from the Operation.—In view of the accidents, which more or less accompany the operation, valuable contributions have been made through literary discussion of the subject, based upon experimental researches and clinical observations.

T. Laffan²²_{June} tells us that "Among the sequelæ of operations are coma, convulsions, epilepsy, brain abscess, pyæmia, the conversion of a serous into a purulent effusion, putrefaction of pus, and paralysis. In some post-mortem has revealed no cause of death, in others suspicious thrombi have been discovered. G. T. Robertson⁹⁰_{July} taking up the value of irrigation, thinks it is not always without risk, as there are a number of cases on record in which sudden death occurred during its employment. Basel⁹⁰_{Aug. 27} is of the opinion that the danger lies in the fluid employed or in the sudden and marked increase or decrease in the intrathoracic pressure. He also states that the alarming symptoms usually set in during the inflow of the injected fluid. Bouveret²¹²_{Oct.} by whom the accidents following an operation have received considerable attention, makes different distinctions and divides them into four groups. In the first he places paralysis due to embolism; in the second, slow development of motion on the same side of the empyema; in the third, attacks of syncope; in the fourth, the attacks in which

eclamptic convulsions and transient paralysis predominate. He only knows of five cases belonging to the first category; cases of the second and third group are very rare, while those of the last class are numerous.

Empyema—Estlander's Operation.—In the general sense we may consider empyema an abscess, bounded on one side by the lung, on the other side by the wall of the chest. This abscess should be opened as we would open a collection of pus in any other part of the body. There are cases of empyema which refuse to heal up, in spite of long-continued free drainage of their cavities. The compressed lung has expanded to the full extent possible, the mediastinum has been displaced, the diaphragm has risen, and the chest-wall has fallen in until the ribs are in contact, and yet a cavity remains. To occlude such a cavity by granulations is impossible, and for this purpose Estlander devised his operation, which consists in removing, not only a certain length or a certain number of ribs, but all the ribs lying in the wall of the empyema.

Le Fort, Thiriar, Boeckel, Bouilly, men who have rendered good service in the field of pulmonary surgery, communicate their results in very valuable papers. Le Fort, of Paris,⁹¹_{Apr. 10} considers the operation of Létiévant-Estlander a very good one. One of his patients had a fistula admitting easily about four ounces of liquid. One day, while in the ward for convalescents, Le Fort injected one hundred and twenty grammes of liquid. Immediately the patient had a dangerous syncope. Following this accident he had a paralysis of the extremities, which passed away very slowly. Le Fort thought he must have had a medullary apoplexy, the primary cause of which was unknown. Thiriar, of Brussels, in the past four years operated on thirteen patients suffering from purulent pleurisy with fistulæ, necessitating nineteen operations for thoracoplasty. In two costal resection was the first step of pneumotomy, in one case the operation was performed according to the modifications of Schede and Sprengel—that is, the old thoracic wall, except the skin, had been resected. Only one patient died from the effects of cold, eleven were cured, and one female patient had only a small fistula. Of the ten cases, seven were operated upon once, a child of twelve years had been operated upon twice, a man of twenty, three times, a woman of twenty-nine years also three times. J. Boeckel, of Strasburg,⁹¹_{Apr. 10} has performed Estlander's operation twelve

times, the results being nine cures and three deaths, one from tuberculosis, the second from cardiac disease, and the third from albuminuria. The other nine operations give six complete, one temporary, two incomplete, cures. Of the two incomplete, that is, with fistula, one was a child, who died later on from phthisis; the other, an adult of thirty-five years, on whom he made a second operation. Boeckel says: "Want of success is due to too timid resection. If it is necessary to obtain a falling down of the chest to resect the rib from behind, one is justified in resecting the scapula. Bouilly, of Paris,⁹¹_{Apr. 10} has performed the operation thirteen times, twelve times on patients from twelve to thirty years old, the other case being a man of forty. The results were, eight definite cures, one persistent fistula, one improved, and three deaths. A report of the surgical clinic of Jefferson Medical College gives a very interesting case operated upon by J. M. Barton, of Philadelphia.⁶²_{June 1} The history of the patient, a man, twenty-five years of age, shows that he had been suffering four years with chronic pleurisy on the left side. In June, 1887, under the supervision of Dr. Barton, the chest was tapped with an aspirator needle and six quarts of sero-purulent fluid were removed, and later on much more. The fluid rapidly reaccumulating, however, a permanent opening between the sixth and seventh ribs was made in July, and a drainage tube inserted. The lung failing to expand, an excision of some of the ribs was proposed, but the patient refused. Six months later he returned, having had a daily discharge of one to two ounces of pus, several mild attacks of blood poisoning, as shown by chills, profuse sweating, and high temperature. Dr. Barton then performed Estlander's operation, removing portions of sixth, seventh, eighth, and ninth ribs. A large drainage tube was introduced into the original opening and the empyemic cavity washed out with antiseptic solutions as before.

Okell,⁶_{July 21} house surgeon at the Leicester Infirmary, reports a case of double empyema, the right side being treated by resection of rib, the left by an incision and free drainage, with complete recovery. Successful operations for empyema, too numerous to report here, are an assurance of the progress made in surgery in this respect.

Empyema Treated by Simple Puncture.—This treatment of empyema no longer harmonizes with the opinion of the majority

of the surgeons of to-day. Wölfler, of Gratz, ²³¹_{Apr.} in a paper before the Society of Physicians of Styria, reports a case of empyema cured by simple puncture. The empyema had developed spontaneously, and was probably due to tuberculosis. Puncture was made with a trocar between the sixth and seventh ribs on the left side, and the pus evacuated by siphon drainage. The lower end of the rubber tube communicated with a bottle filled with antiseptic fluid, the upper end was left in the cavity till no more pus escaped. Healing took place very rapidly, and this method seemed to be preferable to extensive resection of ribs. Wölfler has recently treated three patients successfully by this method. They were told to carry the bottle with the drainage apparatus till no more pus escaped.

Steele, of Chicago, ⁶¹_{v.2,p.668} concludes that "there is no question but that in a certain minority of cases in children simple aspiration once or twice repeated will effect a permanent and satisfactory cure. Aspiration has the advantage of being simple, safe, and occasionally curative, but if it is found that the fluid re-accumulates or septic symptoms develop, then a free incision with drainage is imperatively demanded." On the other hand, speaking of the disadvantages of aspiration, he says: "By this procedure a small amount of pus is left for re-absorption, or it may become an inspissated residuum, according to Abbe, that will result in a secondary abscess in after-life. Surgically considered, it is not as perfect an operation or as scientific a procedure as evacuation by a free incision and the introduction of a large-sized drainage tube." Dr. Steele gives the result of one hundred and twenty-one cases treated by aspiration: twenty-three, or 19 per cent., were cured, six died, and the rest have undergone some other treatment, usually incision. Four cases were treated by aspiration by himself, with the following result: Case 1. Charles F., aged thirteen months; diagnosis; empyema cured by aspiration; five ounces of odorless pus; died three years subsequently of malignant diphtheria.

Case 2. Mamie S., aged thirty months, treated for six weeks for chronic pneumonia by a distinguished physician; cured by one aspiration; twelve ounces of greenish pus withdrawn, very flaky.

Case 3. Baby, aged fourteen months; two aspirations; cured.

Case 4. Infant (Home of the Friendless), empyema; two aspirations; cured.

Beggs¹_{v.2,p.177} refers to the fact that, although exploratory puncture is generally regarded as an operation free from any danger, cases of simple pleurisy converted into empyema are comparatively very frequent. In the statistics of two hundred and forty-six cases, Laffan²²_{v.1,p.461} shows that the danger of aspiration is at least exaggerated, although he himself is not an advocate of this procedure:—

Names.	Serous.	Changed to Purulent.
Ewald,	33	*9
Bowditch,	62	0
Griffith,	151	2
	<hr/> 246	<hr/> 11

* Four of these were turbid from the first, four more were operated on before the fourth week, while in the ninth the cannula was left in.

Empyema Treated by a Valvular Cannula.—This method, practiced by Rogée,⁷³_{Apr.7} was successful in two cases. The apparatus, as previously described,⁸⁶³₁₈₈₃ is a complicated one, but the principle is very simple. The main feature is, that the fluid is not withdrawn suddenly, but the cannula merely inserted. This allows the patient to expel any liquid by coughing or deep inspiration, while its valves prevent the entrance of air, to take the place of the expelled fluid. A temporary loss of pressure thus occurs within the pleural cavity, which is soon balanced by this undergoing a corresponding expansion. Dr. Rochelt¹¹³_{No.32,28,97}; ⁸³⁶_{Jan.7} suggests a method somewhat similar to the one of Dr. Rogée. After making an incision down to the pleura or removing a portion of a rib subperiosteally, he plunges a trocar and cannula into the pleural cavity. Through this cannula he introduces a tube filled with an antiseptic solution and connected with an aspirator. The pus is then removed and the pleural cavity washed out with a sublimate solution. After this the tube is cut off at the level of the mouth of the cannula, and a hard-rubber tube, one centimetre long, is inserted: this tube has a valve at the inner end, which closes at each inspiration, but opens on expiration to allow escape of pus and prevent the entrance of air.

Abscess of the Lung.—Teale's²_{Oct.13} paper on "The Surgical Treatment of Abscess of the Lung and Empyema," read at the annual meeting of the British Medical Association, gives the details of four cases, under his own care, of abscess of the lung opening into the pleura. Two of these recovered after incision and free drainage, the other two died. He also reported two successful

cases under the care of Hartley and Davies. The conclusions bearing upon pulmonary surgery arrived at by Dr. Teale are:—

1. That we are losing our fear of exposing the pleura.
2. That the evil of admission of air into the pleural cavity is not the mere exposure of the pleural surface to the air, or that the lung collapses by the mere admission of air, but that, where there is a fairly healthy lung and pleura, the inrush of air reduces seriously the mechanical power of the thoracic wall over respiration.
3. That in such cases some method of closing the wound to the entrance of air, whilst allowing adequate drainage, must be adopted.
4. That the region of the diaphragm is a situation in which abscesses amenable to surgical treatment frequently occur.
5. Such abscesses can be most safely attacked through the lower angle of the thorax, provided there be dullness at the seat of puncture.
6. As to washing out the cavity of a large pleural, pulmonary, or hepatic abscess-cavity, it is probable that antiseptic washing is of value in the early period, while the fluid is offensive, but afterward it tends to disturb the comfort of the patients and is unnecessary if drainage is effective. As regards excision of a portion of rib, Dr. Teale had no personal experience, but thought it should be reserved for special and exceptional cases.

Sir Spencer Wells²_{Oct. 13} reports a case of abscess in the right axilla. The patient came under his care in 1843. The abscess was opened and air and pus escaped. There was a fistula for a long time, which finally closed. The patient is still alive and well. Reporting this case forty years ago, Sir Spencer Wells advocated at that time the incision of the lung in cases of abscess. He still supports this view and looks hopefully on the operations of incision or removal of parts of the lung in gangrene and on removal of parts of the ribs in exceptional cases.

Gangrene of the Lung.—W. Pasteur, of London,²_{Oct. 20} relates the particulars of a case of pulmonary gangrene treated by incision and drainage. The patient was a delicate-looking boy, aged seven. He had the signs of a cavity at the right upper lobe, which later on developed at the right apex. The remainder of the right lung became pneumonic. Temperature 100° to 103.6°. Expectored daily from two to four ounces of foul-smelling watery fluid, mostly saliva. Being admitted on the 22d of October into the Northeastern Hospital for Children, Mr. Pollard operated upon him on the 13th

of November. The cavity was incised at the anterior extremity of the right second space, one inch from the sternum. Large quantities of gangrenous lung and putrid fluid were expelled through the wound, which reached down to the sixth rib. A counter-opening was made in the sixth space, flanged tubes inserted, and an antiseptic dressing applied. The next morning the child was much relieved, nearly free from cough, expectorating small quantities of frothy, almost odorless, sputum, and free from pain. The cavity was washed out daily once or twice, as occasion required. At the end of a week the washings deposited a copious sediment of pus. The improvement, however, was not maintained. The temperature, pulse, and respirations remained high, fœtor of breath reappeared on the tenth day, and the patient sank rapidly three days later. A large cavity occupied the anterior third of the right lung. It was lined for the most part with a thin layer of granulation tissue. At the inner margin the necrotic process had invaded the pericardium and set up acute pericarditis. The œsophagus was firmly adherent to the right bronchus, and a narrow sinus about three-quarters of an inch long led from a minute valve-like opening in the œsophagus to a small, ragged opening in one of the main divisions of the right bronchus. The gangrene was undoubtedly due to the passage from the œsophagus into the lung of some irritative material along the sinus above mentioned.

Godlee,²_{Oct. 20} at the same Society, mentioned another case of gangrenous abscess at the apex of the lung. The patient died three days after the operation. Hofmøhl,⁸_{Nov. 22} communicates a successful operation for bronchial gangrene following pneumonia. After resection of a piece of rib six to seven centimetres long, he penetrated into the lung with the Paquelin cautery to a depth of six centimetres, until air whistled through the opening. There was only a very small quantity of gangrenous matter discharged. The patient improved rapidly.

Okell,⁶_{Mar. 31} reports a case of pleuro-pneumonia followed by gangrene of the lung and abscess, in which he met with success by opening the cavity and withdrawing the pus.

Foreign Body in the Right Bronchus.—Foster¹⁰⁵_{Oct. 1} reports an unusual case of foreign body impacted in the right bronchus, with recovery through operation. A young man, eighteen years old, while holding a flat tin whistle in his mouth, commenced to laugh,

when the whistle suddenly disappeared into his throat. Severe attacks of dyspnœa, followed after a few seconds by a paroxysm of coughing, occurred immediately afterward. Three hours later the patient consulted Dr. Foster, only complaining of a slight pain near the centre of the sternum. The examination of the œsophagus, as well as a careful laryngoscopic examination, did not lead to the discovery of the foreign body. A peculiar and distinct whistling sound at each respiration was heard, particularly so when the patient coughed. Respiratory murmur was distinct and normal over both lungs. Dr. Foster was certain that the whistle was in the trachea or one of the bronchi. Two days afterward he opened the trachea well below the isthmus of the thyroid. The sharp end of a foreign body could be felt with the little finger, apparently firmly impacted in the right bronchus. It was removed with Mackenzie's long forceps. There was but a slight hæmorrhage, ligatures not being required. Two silk sutures were introduced into the upper half of the wound, the lower part being left open for drainage, and an antiseptic dressing applied. In the afternoon the patient vomited freely and had a severe attack of dyspnœa, due to the regurgitation of vomited matter into the larynx. The dressing had to be reopened again, to allow the air to enter through the tracheal wound. The vomiting was checked by one-fourth grain of morphine under the skin. The patient recovered rapidly, the sutured part of the wound healed by first intention, the rest of the wound presenting a perfectly clean granulating surface.

Ackermann⁹_{Nov. 10} reports another case analogous to the one above. A child, two years old, had swallowed a watermelon-seed which lodged in the windpipe, without giving the patient much inconvenience, except that he had an occasional violent paroxysm of croupy coughing, attended with attacks of suffocation. The ordinary remedies, as well as mechanical means, having been tried in vain, tracheotomy was decided on. Dr. Ackermann opened the trachea below the thyroid isthmus and removed the seed with the aid of a pair of curved slender forceps after some difficulties. The tracheal incision was closed by four sutures. Several stitches were introduced into the external wound, leaving room for a small drainage tube to be inserted in the lower angle. Ten days from date of operation the child was taken home by its mother, perfectly well.

ANÆSTHETICS.

By J. M. BARTON, A.M., M.D.,
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MUCH has been written during the past year upon anæsthetics, and many valuable and instructive summaries of the entire subject have appeared in the various medical journals, though but little that is new has been added. An interesting and exhaustive article, mainly devoted to the history of anæsthetics, has been written by Foy, of Ireland,¹⁶_{Oct., Nov.} who shows that some form of anæsthetic has been in use for many centuries. He finds in general literature references to the practice of anæsthesia in England as early as 1352. Another writer states that "there is very little doubt that the Aryan surgeons used some form of local and general anæsthesia." From them came the tendency to use both, which is recorded in the early Chinese medical literature.¹³⁹_{Apr.}

The relative merits of chloroform and ether are still vigorously discussed by their respective adherents. Chloroform, however, appears to be on the defensive.

INDICATIONS FOR THE SELECTION OF AN ANÆSTHETIC.

In a lecture delivered at the London Hospital, Hewitt⁶_{May 28} calls attention to the necessity of using different anæsthetics according to the character of the operation and the condition of the patient. He states that experience has shown that for general purposes ether, preceded by nitrous oxide, is the best anæsthetic. For his purpose he divides the seriously ill into five groups:—

1. *Asthenia, Collapse.*—In this class he includes all cases in which a condition of extreme prostration has become established, as cases of acute and chronic intestinal obstruction; advanced œsophageal or pyloric stricture; prolonged suppuration with hectic, profound cachectic, or anæmic states; extreme exhaustion following loss of blood, etc. Generally speaking, ether is the best anæsthetic in cases of this class. Nitrous oxide cannot be recommended, either alone or in combination with ether. Chloroform is

not advisable. In these cases it is unnecessary to secure persistent abolition of the lid reflex; when once complete anæsthesia has become established, very little of the anæsthetic will be needed. The head should be kept low and the lower jaw pushed well forward.

2. *Morbis Cordis*.—Uncomplicated disease of the heart does not contra-indicate the use of a general anæsthetic. If no pulmonary œdema or pleural effusion be present the A. C. E. mixture or pure ether administered from a cone will be found to be the most suitable. Chloroform is best avoided unless bronchial mischief or pulmonary congestion be present. In uncomplicated mitral regurgitation notice need hardly be taken of the valvular condition, and ether may be given as in ordinary cases. If the heart be acting feebly and irregularly and there is evidence of extensive valvular disease, ether should not be given by Clover's method, but administered gradually from a cone or towel. If it be found after commencing the administration of ether that cyanosis and feeble or embarrassed respiration are produced no time should be lost in changing the anæsthetic to chloroform.

3. *Functional and Organic Disease of the Brain*.—If any anæsthetic at all be needed chloroform is preferable. If the respiration is not affected, ether or the A. C. E. mixture may be used. If the functions of the medulla are unimpaired chloroform may be preceded by a hypodermic injection of morphia. Mr. Hewitt had one case which he could hardly anæsthetize with chloroform after the use of morphia, and he states that Victor Horsley had a similar experience.

4. *Affections of the Respiratory Passages and Pleuræ*.—In obstructive conditions of the air-passages producing dyspnœa, as aneurism pressing upon the trachea, tracheal stenosis, advanced chronic bronchitis, and emphysema, chronic pneumonia, phthisis, pleural effusions, and empyema, he regards chloroform as the most appropriate agent.

5. *Renal Diseases*.—For this class of cases ether is objectionable, though Mr. Hewitt has used the A. C. E. mixture.

CHLOROFORM.

There are three claimants to the honor of the discovery of chloroform: Liebig, of Germany; Soubeiran, of France, and

Guthrie, of America. A committee appointed by the Chicago Medical Society to investigate this subject conclude, for reasons given in their report,¹⁰⁴ that Dr. Samuel Guthrie is justly entitled to the honor of first discovering chloroform. The Jefferson County, New York, Historical Society proposes,⁹ erecting a monument to his honor.

Ungar,³¹¹ found that animals subjected for a long time to the inhalation of chloroform suffer from rapid fatty degeneration of the heart, larynx, trachea, bronchi, alveoli of the lungs, and kidneys. Five of the animals experimented upon died more than twenty-four hours after "coming out" of the chloroform.

Schmey¹¹⁶ divides deaths from chloroform into two forms: 1st, where the heart stops suddenly from muscular paralysis; 2d, where the respiration ceases from paralysis of the respiratory centres of the spinal cord and the heart continues beating. In investigating the first form in the exposed heart of a chloroformed dog, he finds that "after some time the heart, and particularly the ventricles, begin to quiver and to glisten, the diastole is prolonged, convulsive twitching of the muscular fibres begin, and suddenly the heart stops."

Barck,⁸² of St. Louis, considers the inability of the pupil of the eye to contract when exposed to light during chloroform narcosis as an important sign of danger. "As long as it does contract the patient is safe."

To account for the continued use of chloroform in England and for some of its dangers, the statement has been made⁶ that, "Owing to the lamentable absence of instruction in the methods of administering anæsthetics, few students gain any experience in the modern modes of procedure and are incompetent to etherize a patient in a satisfactory manner; they find chloroform pretty easy and so adopt it." In America, as well, instruction in the administration of anæsthetics does not receive the attention it should.

Hill,² recommends nitrite of amyl, and Watson¹⁸⁵ puncture of the right ventricle, when alarming symptoms arise during chloroform narcosis. Chisholm,⁵⁹ of Baltimore, depends entirely upon Nélaton's method of inverting the patient.

Diakonoff, of Moscow, Russia, corresp. ed., suggests⁵³⁰ the use of saline solutions by transfusion in collapse during chloroform inhalation. He anæsthetized dogs until there was interruption of

the heart's action and of respiration. He then injected into a vein a solution composed of six grammes ($3\frac{1}{2}$) of chloride of sodium, .05 gramme (gr. $\frac{3}{4}$) of caustic soda, and one thousand grammes ($\frac{3}{4}$ 30) of distilled water with speedy relief of the syncope.

Seven cases of alarming symptoms and fifteen deaths from chloroform are reported during the year.

McGraw records a case ²⁰²_{Nov. 21, '87} in which only with great effort was resuscitation accomplished. Chisholm, ⁵⁹_{Jan. 21} reports four cases, in all of which the symptoms were very alarming. All recovered by suspending the body with the head down. Bawn records a case ⁹_{Aug. 18} with dangerous symptoms, and a similar one ²²_{Apr. 4} is reported from England.

Deaths from chloroform reported during the year:—

1. Fibroid tumor of uterus, died same evening ²⁰²_{Nov. 21, '87} with apoplectic symptoms.

2. Adult man, ²⁰²_{Jan.} reduction of dislocated shoulder.

3. Child ⁶_{Apr. 14} of five months, nævus.

4. Kyneton Hospital, laborer ²⁸⁵_{Apr. 16} of forty-two, varicose veins.

5. Royal Infirmary, Preston, ²_{July 7} man of thirty-four, opening of abscess.

6. Royal Berks Hospital, ²_{July 21} man of twenty-six, perineal fistula.

7. Negro prisoner at Memphis, under examination by Dr. Williford ⁷⁴_{July} for insanity.

8. Westminster Hospital, ⁶_{Sept. 1} male of forty-six, malignant growth of pharynx.

9. Northern Hospital, ²_{Sept. 1} a turner of forty-two, amputation of fingers.

10. St. Saviour's Union Infirmary, ²_{Sept. 20} male of forty, ankylosis of knee.

11. Boy of fifteen, ⁶_{Oct. 20} circumcision, two drachms of chloroform first, then the A. C. E. mixture.

12. Lancashire, ⁶_{Nov. 3} young woman, extraction of teeth.

13. Darlington Hospital, ²_{Nov. 3} adult female, ankylosis of both knees, A. C. E. mixture.

14. Boy of seventeen years, excision of knee; less than $\frac{3}{4}$ 6 of chloroform were used. ⁵³³_{v. 28, p. 1087}

15. Male, aged thirty-eight years, ⁵³⁰_{v. 28, p. 1140} tubercular ulceration of the rectum. The last two are reported by Dr. Diakonoff, Moscow, Russia, corresponding editor.

A death from chloroform at Sydney^{Oct. 20} has been followed by a lawsuit, undertaken by the husband of the deceased, and has resulted in a verdict of guilty and an award of two hundred pounds damages, on the ground that the anæsthetic was improperly administered and the patient subsequently neglected.

Knaggs,²⁸⁷_{Sept.} in an article read before the "New South Wales Branch of the B. M. A.," states that nine deaths occurred from anæsthetics in the colony during 1885, '86, and '87. They formed the subject of inquiry by Parliament, and he pertinently asks, Who is responsible?—the operator or the administrator of the anæsthetic? and at the same time, How far is the administrator of the anæsthetic, as well as others who may be present, responsible for the operation?

ETHER.

Hunt,²_{July 14} records five cases recently under his observation in which brain disturbances followed the use of ether administered as an anæsthetic. Graham⁸⁹_{Feb.} lost one case and W. G. Wylie²³¹_{May} lost two a few days after etherization from acute inflammation of the kidneys and uræmic poisoning.

Several young doctors in Philadelphia gave ether to a patient with scalp wounds. He remained in a comatose condition until death, the autopsy showing acute inflammation of the kidneys.⁶⁰_{Feb. 4} I⁶¹_{May 6} lost a patient four days after an abdominal section from the same cause. But three ounces of urine were secreted during the four days. There was no albumen in the urine before operation.

Bernays,¹⁰⁹_{June} of St. Louis, states that an American surgeon undertook to convert Schede, of Hamburg, from the use of chloroform, and in his presence and that of a number of other prominent surgeons administered ether with a fatal termination.

Roux,²¹⁴_{Sept. 16} examined the urine of one hundred and nineteen patients after etherization and found albumen in only four of them, which disappeared in a few days.

Hare,⁸⁰_{May 15} of Philadelphia, investigated the effects of etherization on the temperature of the body. He found that the rectal temperature of a dog fell from 8° to 10° F. after continuous etherization for an hour. Observations on twenty-six patients operated upon at the clinic of the University of Pennsylvania gave an average fall of 2½° F. The greatest was 4.4° F. in a case of sarcoma of both testicles, the least 0.8° F. after the insertion of a drain in a

case of empyema. Duke,² of Dublin, having noticed the collapse after prolonged ether anæsthesia, suggests having an operating table made of zinc or tin, hollow, which could be filled with hot water and would help to prevent the great fall of temperature in a prolonged operation.

COCAINE.

During the year the use of cocaine has been greatly extended, and many important operations have been undertaken without any other anæsthetic. Edmonds,⁶ has used it in hydrocele, the opening of deep abscesses, and once in a suprapubic cystotomy.

Geyl,⁸⁵ removed the entire rectum for prolapse, the operation requiring two hours, in a woman of sixty, the only anæsthetic used being tampons wet with a 10 per cent. solution of cocaine laid on the prolapsed bowel for ten minutes before the operation. The patient spoke highly of the remedy, and said she was entirely free from pain during the entire time. He also removed the cervix of the uterus from another patient, and brought the cervical mucous membrane together. The operation lasted one hour, the vagina, in the field of the operation, having been previously filled with tampons saturated with a 10 per cent. solution of cocaine. There was "not a single exclamation of pain during the entire duration of the operation." Kempf¹¹⁵ removed an ulcerated carcinoma, about the size of an adult fist, from the thigh of a woman of ninety. After the limb had been rendered bloodless by the Esmarch bandage six grains of cocaine were injected in six different places around the tumor. Fifteen minutes later the operation was begun. The patient gave no evidence of pain and had no toxic symptoms. Alezais⁴⁶ prevents all pain from iodine injections in hydrocele by cocaine.

Baracz,⁸⁴ of Iœmburg, uses from $\frac{3}{10}$ to $\frac{3}{8}$ of a grain (0.019 to 0.038 gramme) of cocaine in a 2 per cent. solution, injected with a Pravaz syringe, for the removal of foreign bodies from the hand and elsewhere. For a case of extensive laceration of the hand, requiring suture of several tendons, removal of a portion of bone, and extensive suturing of the skin, he used 2.15 grains of cocaine after applying the Esmarch bandage above the wounded parts. For the removal of a tumor of the parotid, a dermoid cyst over the eye, a papilloma of the arm, incision of a carbuncle, opening of abscesses of the rectum, hand, and leg; for

onychia maligna, for staphylorraphy, for the treatment by the actual cautery of internal hæmorrhoids, for the removal of a lymphoma from the neck, and for the extraction of teeth, he uses with the syringe from one-third of a grain (0.021 gramme) to two grains (0.130 gramme), and as much as three and a half grains (0.23 gramme) when applied to the surface.

In internal hæmorrhoids he uses one and a half grains (0.1 gramme), injecting a portion into the mucous membrane over the growth. He then carries the point of the syringe through the skin, parallel with and near to the rectal mucous membrane, until the point is directly beneath the site of the proposed operation, when the rest of the cocaine is expelled. The pain of the cauterization is then quite trifling. Haenel¹²⁸ calls attention to the importance of injecting the cocaine into the skin and not under it if we wish to prevent the pain of the first incision. The deeper parts may be afterward anæsthetized through the same puncture. He also suggests that the solution be expelled from the syringe drop by drop while the needle is passing through the tissues, so as to control the largest possible field with a single injection. He uses a 5 per cent. solution with a small quantity of carbolic acid to prevent decomposition.

Jaffé³³¹_{Nov. 16} uses cocaine for subcutaneous injection, according to the following formula:—

Hydrochlor. of cocaine,	.	.	.	.	gr. 24 (1.56 grm.).
Carbolic acid,	.	.	.	.	gr. 10 (0.65 grm.).
Distilled water,	.	.	.	.	3 1 (31 grm.).

Among the operations done by him with this anæsthetic are included small tumors, ingrowing toe-nails, tracheotomies, and herniotomies. Allis has also performed herniotomy, using cocaine as the anæsthetic. Corning¹⁰²⁵ claims that operations as extensive as excision of joints can be performed under cocaine with entire absence of pain.

Holgar Rördam,³⁷³_{v. 40, '97} of Copenhagen, uses one grain (0.06 gramme) of cocaine, injected five minutes before commencing anæsthesia with chloroform. He claims that narcosis results sooner, the stage of excitement is absent, and less chloroform is needed.

Fenwick⁶_{May 5} found that he was able to give instant relief in several neuralgic cases by the injection of cocaine into the deep

urethra. In one case of "constant pain in face, limbs, and urethra," of five years' standing, a few drops of a 20 per cent. solution gave relief to "all pains in sixty seconds." In a case of painful wry neck thirty drops of the same solution was similarly applied; "in sixty seconds he was rotating his head without pain." The same application caused the pains of an intercostal neuralgia to disappear in thirty seconds. It failed in some cases where tried.

During the year four deaths and many cases of dangerous symptoms are reported from the use of cocaine.

Lobker⁶⁹_{Feb. 2} reports five cases of collapse following small doses, and Mattison²²⁴_{Jan. 7} has collected and reports in full thirty-nine cases of severe toxic symptoms following the use of cocaine, the escape from a fatal termination being exceedingly narrow in several instances. Toxic symptoms were exhibited in an adult after even so small a dose as four drops of a 4 per cent. solution, given hypodermically. The symptoms in Dr. Mattison's cases were quite varied and included nausea, emesis, headache, blindness, deafness, loss of taste and smell, profuse perspiration, lividity, gastric cramps; pulse frequent, feeble, irregular, intermittent; respiration shallow, gasping, irregular, difficult, convulsive, suspended; impairment of gait, speech, and swallowing; muscular rigidity, palpitation, sense of suffocation, and constriction of chest; loss of motion and sensation in limbs; restlessness, prostration, giddiness, faintness, feeling of impending death; convulsive twitchings, paralysis, mania, delirium, convulsions, opisthotonos, and unconsciousness.

Cases of poisoning, with similar symptoms, are reported by Szuman,¹¹⁶_{Aug.} S. Mitchell,⁵⁹_{Sept. 15} and Haenel,¹²³_{May 1}. In one case reported by the latter epileptiform convulsions lasted five hours after one and a half grains (0.10 gramme).

Abadie²²_{Oct. 17} reports a case in which he injected two-thirds of a grain (1.04 gramme) of cocaine into the upper eyelid of a woman of seventy before performing an operation for entropion. Immediately after the operation the patient became unconscious and the face congested. Artificial respiration and the subcutaneous injection of ether restored her so that she was able to go home, but she died the same evening. Simes⁹_{July 21} reports a fatal case in a male, aged twenty-nine years, on whom he was about to perform internal urethrotomy. Previous to the operation one drachm (4 grammes) of a 20 per cent. solution of cocaine was introduced into the

urethra by means of a long-nozzled urethral syringe, which passed about four inches into the canal. "The instrument had scarcely been taken out when the patient made a foolish remark, the muscles of his face began to twitch, the eyes staring, pupils dilated, frothing at the mouth, face much congested, respiration interfered with, and ending in a violent epileptiform convulsion lasting some seconds. These convulsions were repeated with increasing violence several times a minute, the whole muscular system taking part in the spasms. The action of the heart was not much interfered with, the respiratory function seemed first to fail, and then the heart's action became irregular and slow, and the entire surface of the body became deeply cyanosed. Death occurred twenty minutes after the first convulsion." At the autopsy the brain and lungs were found congested, the right side of the heart was empty, the left was filled with currant-jelly clots. Mattison²²⁴_{Jan. 7} refers to two fatal cases, one occurring in dental practice in Poland, the other in France.

Langlois and Richet³⁶³ state that elevation of temperature favors the occurrence of convulsions after the use of cocaine.

CHLORIDE OF METHYL.

Bailly,⁷⁰_{Feb. 5}; ²⁶_{Apr. 2} of Chambly, has devised a method of producing local anæsthesia with chloride of methyl by saturating tampons composed of cotton and floss-silk and covered with silk gauze. These are handled with forceps of wood or ebonite and laid on the parts, which soon become sufficiently insensible to permit the performance of minor operations. If kept on too long a blister or even an eschar is produced. The application has proved useful in the various forms of neuralgia. Bailly has devised an apparatus for the transportation of the drug in a vacuum.

Buxton,²_{July 28} is of the opinion that the methylene used for general anæsthesia is not bichloride of methylene, but a diluted chloroform, and that pure bichloride of methylene is not an anæsthetic. Richardson,³⁸_{Oct. 9} of London, in his earlier experiments, employed pure methylene and found that it was an anæsthetic; the cost of its production, however, being prohibitive, he used a less pure product, which contained a small quantity of alcohol, chloroform, and water. This he found more satisfactory as an anæsthetic and a more stable compound.

Sir Spencer Wells,² extols the virtues of bichloride of methylene, which he has now used for over twenty years.

Eichholz and Genther⁴¹ have made a series of experiments comparing chloroform and methylene, and find that (1) the period of excitement and narcosis sets in about the same time with each drug; (2) the pulse increases during the period of excitement with chloroform, but not with methylene; (3) death occurs much sooner with chloroform; (4) there is an increase in the flow of saliva with methylene, but not with chloroform. They also state that (1) the preparation sold as methylene is a mixture of chloroform and methylal alcohol; (2) this is to be preferred to pure chloroform; (3) pure bichloride of methylene brings about anæsthesia as quickly and as deeply as either of the above preparations. It is not so lasting in its action and not nearly so dangerous.

ERYTHROPHLÆIN.

Erythrophlæin is obtained from the bark of the *Erythrophlæum Guineense* or *Judiciale*, or "red-water tree." It is the Sassy, Tali, or Cassy bark of the natives of the Congo. It is claimed to belong to the leguminous order, sub-order *Casulpiniceæ*, trib. *Dimorphandraceæ*, genus *Erythrophlæum*, Afz. The tree grows to the height of from forty to one hundred feet and is found on the west coast of Africa. The bark is used to poison arrows and as a test for crime. If vomited, the accused is declared innocent; if retained and symptoms of poisoning appear, he is at once stoned to death.

During the year erythrophlæin has attracted much attention, over fifty different articles in various medical journals having come under my observation. Some of these articles are lengthy and composed mostly of original observations and experiments. The testimony is conflicting, and it is still difficult to determine the value of the drug and the place it will ultimately occupy.

Early in the year Lewin, of Berlin, published, almost simultaneously, in the journals of England, Germany, and the United States, an account of the new anæsthetic, "haya erythrophlæin." There had been sent to him from Africa under the name of "haya poison" a small quantity of a dark-brown, amorphous mass, the markings upon which proved that it had been taken from arrow-heads. He made and published⁴ a careful physical, chemical, and physiological examination of the substance. He found that it

had an anæsthetizing effect upon the conjunctiva similar to cocaine, though the effect was produced much more slowly, lasted much longer, and caused some temporary irritation of the conjunctiva. When injected into frogs it produced paralysis of the extremities and a reduction of the pulsations of the heart of from thirty to eight in the minute.

In rabbits it caused irregularity in the respiration, a gradually increasing weakness of the animal, and a singular form of convulsion. The head fell forward to the ground, while the rest of the body remained upright, convulsive movements beginning in the head and running gradually over the rest of the body, the limbs remaining passive. Before this a loss of sensibility of the surface of the body was observed. In pigeons it caused vomiting, purging, the above-mentioned respiratory symptoms, and death during terminal convulsions.

From his experiments Lewin regarded "haya poison" as similar to the other African arrow-poisons already known, and probably identical with the arrow-poison of the Samoli people, the Ouabaio. The symptoms were also similar to those of poisoning by erythrophlæum. On further search he found in the mass small pieces of bark, which proved to be the bark of the erythrophlæum. He obtained from Merck some hydrochlorate of erythrophlæin and found that a 2 per cent. solution contracted the pupils and caused a loss of feeling in the eye, lasting from ten to twenty-four hours; the irritative action of the drug was, however, considerable. In cats it caused cloudiness of the cornea, salivation, running at the nose, and severe sneezing. A 0.25 per cent., 0.1 per cent., or a 0.05 per cent. of the hydrochlorate caused anæsthesia of cornea and conjunctiva in cats, rabbits, dogs, and guinea-pigs, together with contraction of the pupil similar to that produced by the "haya poison."

This action began in fifteen minutes and lasted from several hours to two days. "If injections be made into the eyelids these will be rendered insensible, but the eye will retain its sensitiveness. One four-hundredth of a grain (0.00016 gramme) will produce anæsthesia of the conjunctiva. If one one-hundredth to one-fortieth of a grain (0.00065 gramme to 0.00162 gramme) in solution be injected into a guinea-pig the experimenter may cut deep into the muscles without causing any pain."

Dr. Lewin had an extremely painful wound produced by cutting himself with glass. A few drops of a 2 per cent. solution caused the pain to cease in ten minutes, and even severe pressure could not again produce it. Applied to the tongue, it causes a most peculiar numbness. It is an active poison and requires care in its use.

Before the Berlin Medical Society, on February 8th, Liebreich, the discoverer of chloral, denied the vegetable origin of this substance, claimed ⁶⁵⁰_{No. 8} by Lewin to be the active principle of the Erythrophlæum Judiciale, and attributed the active principle of the preparation used to be the poison of the naga haya, or spectacle snake; and further stated that if any erythrophlæum was present in the sample experimented upon it was probably an accidental impurity.

Liebreich maintained that if erythrophlæin had any anæsthetic power, it was in common with a number of other substances that act as styptics and caustics, such as perchloride of iron. After the injection of this, as well as other styptics, he had cut out pieces the size of a cubic centimetre without the expression of any pain. He further denied that it had any anæsthetic effect on the conjunctiva or sclerotic, but only on the cornea.

Karewski ⁶⁹_{Feb. 23} has made a series of experiments, which in the main appear to confirm those of Lewin. In no case, however, did Karewski succeed in producing complete anæsthesia, for even under the most favorable circumstances, when the injection was combined with a simultaneous production of anæmia of the part, the sensation of touch still remained, though that of pain was removed. On the nasal mucous membrane a solution of one two-hundredth, applied on tampons, produced analgesia in eighteen minutes. Applied to the skin it produced no effect.

At a meeting of the Berlin Medical Society Karewski stated ¹¹³_{Feb. 26} that the subcutaneous injection of at least one twenty-fifth of a grain (0.0026 gramme) was necessary to produce analgesia, that it did not act more than half an inch from the point of injection, but its effects lasted several hours. Violent pain occasionally occurred at the point of insertion, coming on in a few minutes and often lasting several days. In a number of cases of neuralgia favorable results were obtained. Two cases of lumbago, one of brachial neuralgia, one of sciatica, and one of intercostal neuralgia were treated by the subcutaneous injection of from one

thirtieth to one-seventh of a grain (0.0021 gramme to 0.0095 gramme). As a result very severe pain was produced, which lasted for an hour and a half, after which it subsided and with it the original pain, the latter remaining away twenty-four or more hours, and in some cases permanently.

Goldschmidt³¹⁹_{Feb. 18} claims that one drop of a one thousand solution produced in fifteen minutes anæsthesia of the conjunctiva and cornea, lasting three to four hours, and that the anæsthesia is capable of being indefinitely prolonged by repeated instillations of the drug. He found that in the rabbit the cornea may be cut through or touched with the actual cautery without any evidences of pain, yet seizing the iris was evidently painful. There was only slight temporary irritation of the conjunctiva after the use of a one to one thousand solution, the pupil did not enlarge, intraocular pressure was not increased, and no corneal turbidity ensued after several days' use of the solution.

The drug was then tried in the out-patient department under the care of Dr. Forster, and its effects were found to be excellent; splinters of iron in two cases were extracted from the eye under the use of a one to one thousand solution, and the lachrymal canal, in another case, was slit up without pain. Perfect insensibility of the cornea and conjunctiva were produced in fifteen minutes and lasted four hours.

Carl Koller⁸⁴_{Feb. 11} instilled two drops of a freshly prepared one to four hundred solution of erythrophlæin hydrochlorate into the eye of a dog, producing irritation at once and congestion in a few minutes. In thirty minutes the irritation had ceased, and the cornea was completely anæsthetized, remaining so for several hours. Severe inflammation followed, accompanied by great cloudiness of the cornea, which disappeared by the third day. Koller experimented upon himself, using a one to eight hundred solution. He felt "a sharp burning pain one or two minutes after instilling two drops of the solution; at the same time injection of the conjunctiva occurred, and the eye filled with tears. The burning feeling increased in intensity, and along with hyperæmia of the skin, the pain radiated all over the corresponding side of the face, in the ear, and especially in the nose. The pain and symptoms of irritation reached their maximum about twenty minutes after the beginning of the experiment, then grew gradually less and less,

and vanished entirely in forty minutes." The cornea was then completely anæsthetic; even in the second half of the period of irritation the sensibility was diminished. The anæsthesia remained complete for several hours, and next day even the reaction to touch was much lessened. There was no change in the pupil. One and a half hours after the beginning of the experiment vision became cloudy; a light mist appeared before the object, caused by a cloudiness of the epithelium of the cornea. The eye seemed devoid of lustre. Toward evening the cloudiness increased, and the spectral ring, red outside, blue inside, the well-known symptom of glaucoma, appeared around the lights. The next day the cloudiness was less, but lasted throughout the day, and only disappeared on the third day.

Trousseau²⁴_{Feb. 12} used solutions of three to one thousand, six to one thousand, and twelve to one thousand, the last being considered by him as too strong for the human eye. He obtained anæsthesia of the cornea but not of the conjunctiva; it lasted from a half an hour to one hour. He operated painlessly upon three cases of cataract. Trousseau considers anæsthesia produced by non-irritating solutions of erythrophlæin as longer in appearing, more durable, and less complete than that obtained from cocaine.

Schoeler⁴¹_{Feb. 16} verifies the statements of most of the other observers, but remarks that conjunctival anæsthesia is rarely complete and sometimes does not occur at all. The irritative symptoms are of no importance, as they always disappear and leave no ill effects.

Onodi⁵⁷_{Apr. 29} with two drops of a one to two thousand solution produced anæsthesia of the cornea in twenty-one minutes and of the sclerotic in thirty-four minutes. He used solutions of one to five hundred on the gums, tongue, and on the conjunctival and urethral mucous membranes. The anæsthesia was incomplete and in circumscribed areas. After using two drops of a one to one thousand solution on the conjunctiva, the patient complained of burning headache and dizziness, and then fainted.

Kaposi⁸⁴_{Mar. 3} operated with the curette upon a number of cases of lupus, using erythrophlæin by injection as the anæsthetic. He also applied it with a pencil to granulating wounds. Seventeen experiments in all were made by him. He finds that erythrophlæin, subcutaneously employed, produces local anæ-

thesia in doses of from one twenty-fourth (0.04 gramme) to one-third (0.3 gramme) of a grain. Anæsthesia occurs in fifteen minutes, lasts from one to three hours, and is limited to the immediate neighborhood of the injection. Analgesia was often more complete than anæsthesia, as the sensation of touch was seldom lost. Local symptoms of irritation sometimes occurred with one twenty-fourth (0.04 gramme) of a grain, always when one-sixth (0.18 gramme) to one-third (0.3 gramme) was used. These symptoms were burning sensations at the site of the injection and very severe pains radiating therefrom, lasting many hours and in some instances one or two days. The objective symptoms were redness, swelling, elevation of temperature, and the formation of wheals at the place of injection. General toxic symptoms occurred in from fifteen minutes to one hour after a dose of one-third (0.3 gramme) of a grain. They consisted of dizziness, dilatation of the pupils, weakness, slowing of the heart and pulse, acceleration of the breathing, nausea, and vomiting, all continuing for many hours.

Von Reuss⁵⁷ remarks that a one to four hundred solution caused pain, injection, and opacity of the cornea. The anæsthesia was never so complete as that produced by cocaine.

Lipp⁸⁴ observes that the injection of one-sixth of a grain (0.18 gramme) of erythrophlæin produced slowing of the pulse, palpitation, convulsive pains about the heart, and dyspnœa. Prolonged local inflammations and infiltrations were also produced, and complete anæsthesia was obtained but rarely.

Theobald,⁹ of Baltimore, reports the successful use of a one to one thousand solution for the removal of a foreign body from the cornea. In another patient, on whom he proposed to perform an iridectomy for subacute glaucoma, a single application of two drops of a one to one thousand solution was made. Within a few minutes the eye became irritable, painful, and the conjunctival injection greatly increased. In fifty minutes there was marked cloudiness of the cornea, which lasted four hours. The patient suffered great pain until the next day.

Dabney,⁵⁹ of Louisville, reports an operation for strabismus, under a one to one thousand solution of erythrophlæin. Anæsthesia was not complete until one hour after instillation; the grasping and cutting of the conjunctiva was painless, there being no irritation.

Epstein³¹⁹_{No. 9} injected subcutaneously two drops of a one to two thousand and of a one to five hundred solution in an experiment upon himself without any result. A one to one hundred solution reduced the sensibility of the part, though full anæsthesia was not produced. The parts were afterward painful when moved.

Lœwenhardt⁴_{May} reports that in the eye it produced anæsthesia, though irritation of the conjunctiva and cloudiness of the cornea followed its use. Injections for minor surgical operations were not successful. The application of a one to one hundred solution to the tongue for the purpose of removing a papilloma was not successful in relieving the pain during the operation.

MIXTURE OF NITROUS OXIDE GAS WITH OXYGEN.

Martin,¹⁷_{Jan. 28}¹⁵¹_{Mar. 1} of Lyons, has produced long-continued anæsthesia by the administration of nitrous oxide gas with oxygen, under pressure, according to the method of Paul Bert. He kept an animal under full anæsthesia for seventy-two hours in a bell-glass, in an atmosphere composed of eighty-five parts of nitrous oxide gas and fifteen parts of oxygen. The mixture was made to flow through the bell-glass at the rate of fifteen litres per hour, and at a pressure of from one hundred and ten to one hundred and twenty centimetres. The respiration was calm and regular, and the animal recovered when removed from the bell-glass as promptly as a patient from a half-hour's etherization.

The cost of the pneumatic apparatus which it would be necessary to use to produce anæsthesia by this method in the human subject is so great¹³_{Ed. 218, H. 6} as to prevent its coming into general use, though Klikowitsch, of St. Petersburg, stated long ago that the increased pressure was unnecessary. Witzinger,¹¹³_{Jan. 6} of Vienna, reports three successful cases where operations were performed under the mixture of nitrous oxide gas and oxygen at normal pressure. The first was an excision of the hip, performed by von Mosetig in a case of suppurating coxalgia. The patient breathed through both mouth and nose a mixture of eighty-eight parts of nitrous oxide gas and twelve parts of oxygen. There was no excitement, and in one minute and two seconds he was anæsthetized. Neither the incisions, the application of the chain-saw, nor of the chisel produced the least movement. The patient breathed with perfect regularity, the contractions of the heart were strong and regular, and the pupils were

dilated. The inhalation was continued for eighteen minutes, when the mixture being exhausted, chloroform was substituted, most of the operation being completed while the mixture of nitrous oxide was used. There was no vomiting or nausea. Witzinger reports two other minor operations under this mixture, in which anæsthesia was maintained with equal success. Bayer, of Prague, corresp. ed., in a special report states that Hillischer's apparatus for the administration of these gases is now so constructed that the gases are in separate compartments, their flow being so regulated by stop-cocks that the proportion may be varied at any time during the inhalation.

BROMIDE OF ETHYL.

Szuman, ¹¹⁶_{Apr. 28} of Thorn, has used bromide of ethyl since 1883 in one hundred and twenty or one hundred and thirty minor operations, such as extraction of teeth, removal of small tumors, scraping of abscesses, and in obstetrical practice. He applies it with a mask, as in chloroform inhalation, using from ten to thirty drops, though but rarely the latter. He obtains full anæsthesia, though the patient is not always entirely unconscious, the duration of the anæsthesia being very short. Applied on the corner of a towel I regard it with favor when but a single measured dose is used and not repeated, as it answers admirably in short, painful operations and in the reduction of uncomplicated dislocations. Szuman considers bromide of ethyl contra-indicated in plastic operations, in nervous subjects, and in those suffering with phthisis, or disease of the heart or kidneys. In large doses he considers it as dangerous as chloroform or ether, having known of two deaths from its use, in one of which but fifteen drops of the drug were employed, in the other one hundred and fifty drops were given during a "Battey's" operation. In labor he uses it only during expulsive pains. He has employed it successfully in some surgical cases combined with the local application of cocaine.

Eschauzier, a dentist of Brooklyn, N.Y., had the misfortune to lose a patient from bromide of ethyl after the extraction of a tooth. "She recovered from the anæsthetic and shortly afterward was taken with choking." The cause of death was found at the autopsy to be asphyxia from pulmonary congestion. She had a fatty heart. The jury exonerated the dentist and recommended that in all doubtful cases the patient should be examined

by a competent medical man before the administration of an anæsthetic for dental purposes. In a letter to the editor of the *ANNUAL*, Dr. Eschauzier states that bromide of ethyl is being rather extensively used, unknowingly, by dentists throughout the United States under another name. The only preparation that it undergoes before selling is the addition of a few drops of attar of roses.

OXYGEN AND CHLOROFORM.

Kreutzman,^{319 151}_{No. 36; Mar. 1} of San Francisco, has tried the method of Neudörfer, of Vienna, administering a mixture of chloroform and oxygen. He attaches, with the intervention of an exhausting pump, an elastic bag to Junker's chloroform apparatus. In this way oxygen is pumped through the chloroform and the patient inhales oxygen impregnated with chloroform vapor. He speaks very favorably of the results obtained from the use of this mixture in twenty-three operations performed by Morse, of San Francisco.

NITROUS OXIDE GAS.

Taylor⁵³_{Oct. 20} urges the greater use of nitrous oxide gas in surgery and speaks of a new portable apparatus for its administration. It can be used during the changing of dressings and for slight operations. He recalls the fact that Marion Sims performed an ovariectomy, lasting half an hour, during which the patient was kept under the influence of the gas. I often use it to examine and reduce fractures and dislocations. Taylor advises its use to precede the administration of ether, so as to avoid the period of excitement. He states that there were but three deaths from nitrous oxide gas between 1870 and 1885.

MANDRAGORA.

This drug has been experimented with by Richardson,³⁸₂₁₉ of London. He made a tincture by a five weeks' maceration of the root in fine powder in alcohol diluted with five times its bulk of water. This product he found "to possess the most active properties." It has a prompt, decided, and rather persistent action as a local anæsthetic. When fatal doses were administered to animals, death took place by failure of the respiration, not, apparently, from trouble with the innervation, but from a flagging and final cessation of the action of the respiratory muscles, due to

obstruction of the bronchial passages by an excessive accumulation of secretion.

GLEDITSCHINE.

Palmer²³⁴ reported upon this agent to the Detroit Academy of Medicine. He stated "that in all the experiments of Claiborne, Knapp, and others an alleged -2 per cent. solution of the alkaloid was used. An examination of this solution showed that it contained nearly 8 per cent. instead of 2 per cent. of alkaloidal salt, consisting of a mixture of cocaine muriate and a small proportion of a sulphate, presumably that of atropine." The alkaloid obtained from honey-locust leaves does not have any such effect as this gleditschine.

DRUMINE.

There appears good reason to conclude that drumine, an alleged anæsthetic alkaloid derived from the *Euphorbia drummondii*, is not only not an anæsthetic, but also not an alkaloid. It seems to be a compound made up, in great part, of calcium oxalate. It is announced,¹ that the purveyors of drumine having found it unsatisfactory, no longer furnish it.

STROPHANTHUS.

Strophanthus has been experimented with by Steinbach,³ who instilled two or three drops of an aqueous solution of the ethyric or alcoholic extract into the eye of a rabbit, and one drop more fifteen minutes later. In thirty minutes after the first application complete anæsthesia of the cornea, sclerotic, and conjunctiva was observed. The cornea remained transparent, the pupils normal, and there was no trace of irritation, its action lasting from two to twelve days. Injected under the skin, it produced local anæsthesia. He made some experiments upon his own eyes and those of others. Two or three drops of the same solution placed in the eye produced no pain, and in fifteen minutes the sensation of a foreign body was felt; in thirty minutes the cornea was completely anæsthetized, remaining clear and transparent. The tension was a little augmented, vision and accommodation not altered. The anæsthesia lasted from three and a half to five and a half hours, a slight opacity of the cornea which occurred at the last disappearing with the return of sensation.

MISCELLANEOUS ANÆSTHETICS.

Helleborin has been discovered by Venturini and Gasparini¹⁸⁹_{July 20; Aug. 4}² to produce local anæsthesia when applied to the eye. Its effects last half an hour and are limited to the cornea. There is no irritation. It causes local anæsthesia when injected under the skin, but care must be taken, as it has great effect upon the heart.

Connor exhibited to the Detroit Academy of Medicine a sample of the alkaloid of casa-bark. It was stated that a solution containing one-tenth of 1 per cent. of the alkaloid has as much effect, and a more lasting one, than a 2 per cent. solution of cocaine. Casa-bark is one of the names of the bark from which erythrophlæin is obtained.

At a meeting of the Société de Biologie, Oscar Liebreich³_{Apr. 18} read a communication on substances which cause local anæsthesia. Many of them act not by entering the general circulation, but by their direct effect upon the tissues with which they come in contact. Hydrochlorate of ammonium and the bromide and sulphate of ammonium produce anæsthesia; the carbonate and nitrate are without effect. Sulphate of copper is inactive, but iron salts, particularly the sesquioxide, have an anæsthetic action without producing coagulation at the point of introduction. Acetate of lead is anæsthetic, zinc salts are not. Among organic substances, hydro-quinine, resorcin, antipyrin, substances belonging to the digitalis group, and serpent venom, in small doses, are active. Thallin, alcohol, ether, and glycerine have no action. Essential oils, such as oil of turpentine, hydrate of terebene, eucalyptol, oil of chamomile flowers, and a number of others, have a remarkable effect. According to Liebreich these substances act by destroying the nerve ends and by irritating the neighboring parts, causing what has been called "painful anæsthesia." Some substances, such as cocaine, do not cause painful anæsthesia and are followed by contraction of the vessels. Substances that produce the former effect lead, on the contrary, to vascular dilatation, and have a caustic action, particularly hydro-quinine. This anæsthetic and caustic action is also observed in distilled water when injected subcutaneously.

SURGICAL DRESSINGS AND ANTISEPTICS.

By JOHN H. PACKARD, A.M., M.D.,

PHILADELPHIA.

So COMPLETELY has the antiseptic idea permeated professional thought, and especially in the details of surgical practice, that the two topics embraced in the above heading could scarcely be treated separately. The material relating to them must therefore be combined; but I shall endeavor to arrange it in the form most available for the reader.

That the question is no longer as to the acceptance of the antiseptic system, but as to the best materials to be used in carrying it out and the best methods of employing them, must be obvious upon the most superficial survey of the literature of the past year. A number of books and pamphlets, devoted to the exposition of this subject, have been published. The journals in every quarter of the globe have been flooded with articles, theoretical and practical, general and special, explaining the system, urging its importance, dwelling on its details. Many of these are, of course, mere repetitions of substantially the same facts and ideas. But the result of all this has been not only a very marked change in methods of practice, but a widening of surgical possibilities such as could scarcely have been foreseen by the most sanguine of the earlier advocates of the antiseptic system. Another and most unexpected result has lately made itself manifest. The ideas based upon the experience of surgeons in pre-antiseptic times must be to a very large extent modified, and some of them will necessarily be abandoned. For lack of space I must content myself with the bare mention of this fact, abstaining from the discussion of the interesting and important topics which it suggests.

Yet there are not wanting those who, while they do not declare themselves opposed to the antiseptic system, are inclined to find objections to the methods, at least, of its employment. Thus Senger⁵⁹_{Nov. 17} asserts that strong antimycotics are dangerous, while weak ones are useless. He thinks that strong solutions are inad-

missible, by reason of the risk of their doing harm, in the grave operations where they are most needed for the destruction of germs. He says that living tissues, if injected, cannot be freed from the poison without damaging them, and would limit the use of antiseptics to sponges, instruments, and other lifeless vehicles of infection. These objections seem to be hardly well-founded, in view of the fact that antiseptic measures are directed against germs from without the living organism. It is not assumed that the tissues are "infected" and must be purified, but only that the surfaces are to be freed from germs which would prove sources of fermentation.

Monroe, of Louisville, Ky., raises the question whether antiseptics, carbolic acid, creasote, iodoform, are not used to an unjustifiable extent, asserting that some operating-rooms contain odors sickening to both surgeon and patient. Against this it is only necessary to adduce daily experience; the antiseptic system is carried out most thoroughly, both in hospital and in private practice, by a very large number of surgeons, yet they are not sickened, and their patients do well. Dr. Monroe asserts that as good results, if not better, are obtained by those who do not use antiseptics, but this is true only in a partial sense, and where the peritonæum is involved. Indeed, it may be broadly stated that the only department of surgery in which the value of antiseptics can be doubted is in that of the abdomen and female pelvis. Thus, Erichsen having claimed for antiseptic surgery that it renders the treatment of wounds practically painless, Tait, on the contrary, declares that he gave up the use of antiseptics because they induced more pain, fever, and general disturbance than patients experienced when treated without them; and, while this may be so in his special line of practice, surgeons generally will sustain Mr. Erichsen's opinion.

Again, Ricklin,⁵⁵_{Apr. 7} in an article headed "Intoxications Mortelles par le Sublimé Employé Comme Antiseptique," cites cases of the kind reported by Ziegenspeck, Fleischmann, Steffek, Virchow, and Kümmel; but these cases are almost wholly obstetrical or gynæcological.

Granting that some of the substances used as antiseptics have an unpleasant odor, and that some of them are injurious when applied to certain regions or tissues of the body, it must be remem-

bered that the brilliant experience of the profession with this method is as yet by no means mature, and that much has yet to be done in settling its details.

Another phase of the reaction against antiseptic surgery is presented by the suggestion, now many times made, that *aseptic* surgery is the real desideratum; that "surgical cleanliness"—a favorite term—meets the requirements of the case. It seems to me that this is a mere refinement of words. We want our hands, our instruments, our appliances of all kinds, and the field of operation, to be aseptic; but we want also to keep up this condition of things, and, therefore, we must use dressings which not only are aseptic when put on, but which have the power of preventing the occurrence of septic changes—in other words, which are antiseptic. Sterilize everything about a wound, and bar the access of germs, cocci, etc., which would cause fermentation, and asepsis is supplemented by antisepsis, with the certainty of a good result.

One other point. The terms "disinfection," "disinfectants," might, perhaps, be properly applied to the change made in the material rubbed off from the surgeon's hands or instruments, and to the materials used for the purpose. But I venture to suggest that neither the hands nor the instruments are "infected," and that it would be more scientifically accurate to substitute the terms "sterilization," "sterilizers," etc., in speaking of these processes.

Sterilization or Disinfection of Air.—The sterilization of the air in rooms to be used for operations has received much attention. Getz, of Marshalltown, Iowa, proposes⁶¹_{Sept. 16} a cabinet to inclose the patient, the operator, and three assistants, the etherizer and three other assistants to remain outside. The walls are composed of bleached dairy-cloth stretched over a frame, the open side of which is attached to the frame of a window in the room. The patient, on the operating-table, lies with the feet or side toward the window, as may be desired; the head is exposed for the administration of ether by a gap in the curtain, and another gap at the side enables the other assistants to pass in clean sponges, etc., as they may be required. Dr. Prince, of Illinois,⁴³_{Jan} describes and figures an arrangement for forcing sterilized air into operating-rooms, by means of an engine driving a fan, the current from which passes through a

series of layers of cotton. This air is warmed by gas-jets and moistened by steam.

Ingenious as these contrivances no doubt are, their value is not so certain. The observations of Le Fort¹_{Sept. 1} and others, and, in fact, daily experience, show that danger arises not from the contact of air itself, but from impurities of hands, instruments, and other solid bodies. It may, indeed, be suggested that Dr. Prince's blower, by disturbing the dust, if any remains in the room, may actually set in motion germ-carrying particles.

Mention may be made of a *pulvérisateur automatique* devised by Lucas-Championnière,²¹²_{June} and of the *pulverstäuber* or powder-duster of Partsch,⁷¹_{Mar. 1} as convenient means for sterilizing air; but in view of the doubt that at present exists as to the necessity for such sterilization, these ingenious appliances can scarcely be looked upon as of great importance.

Sterilization of Hands.—Disinfection of the surgeon's hands (and, of course, of those of his assistant or assistants also) has been made the subject of a pamphlet by Fürbringer, of Wiesbaden.¹²²⁹ This writer goes further than Kümmell, of Hamburg, or Forster, of Amsterdam, who had discussed the cleanliness of the surgical hand, in that he directs special attention to the spaces under the free edges of the nails as lodging-places for dirt, and with it for infectious germs. By experimental research the fact has been demonstrated that this warning is well-founded, and to obviate the danger Fürbringer advises that the subungual spaces be first scraped; the hands should then be well washed with soap and hot water and a nail-brush thoroughly used; a washing with 80 per cent. alcohol follows, and finally a soaking for at least one minute in a one to two thousand sublimate solution. Some surgeons omit the application of alcohol. The hands, thus rendered aseptic, should either be allowed to dry by evaporation or be wiped upon a sterilized towel. Nothing should be touched with them which has not been sterilized, and during a prolonged operation they should be, from time to time, washed again in the sublimate solution. The assistants should rigidly observe the same precautions. Reverdin recommends the following¹⁹⁷_{Nov. 20} surgical soap: oil of bitter almond, seventy-two parts; soda-lye, twenty-four parts; potash-lye, twelve parts; sulphocarbolate of zinc, two parts; essence of roses, 9.5 parts. The oil and lyes are mixed, the sulphocarbolate of zinc slowly added with constant

agitation. The mixture is kept for several days at a temperature of 70° F. (21.9° C.) Vogel, of Eisleben, ⁶¹, advises rubbing warm oil into the skin of the hands and then applying powdered borax, after which soap and water will cleanse them thoroughly. Landsberg, of Breslau, ⁴⁵ gives, as the result of elaborate experimentation, complete support to Fürbringer's views. He recommends rubbing the skin with glycerine or lanolin as one step of the process of sterilization, preferring the former on account of its affinity for water, and the latter on account of its freedom from germs.

Sterilization of Instruments.—This is a matter which has attracted much attention; and many surgeons have abandoned altogether the use of instruments not made wholly of metal, in order to avoid a supposed difficulty in insuring complete cleanliness or asepsis in those with wooden or ivory handles. I myself believe that with due care the latter can be employed with entire safety. It may be, indeed, that the idea of greater security, attached to the fact that the instruments are wholly of metal, may lead to less scrupulous attention to their cleansing after operations as well as to their sterilization previous to use.

Davidsohn, of Berlin, ⁴ _{Aug. 27} discusses very fully the question of disinfection of instruments, and announces the following as the result of his experience: After an operation the instruments should be put into cold water, and then cleaned of pus, etc., by brushing; tubes and cannulæ should be squirted through several times, and then filled with water. Next the instruments are to be boiled for five minutes in a covered vessel at 212° F. (100° C.). On being taken out they are to be dried with a sterilized towel. Before being again employed they are again boiled for five minutes, allowed to cool, and can then be used without soaking in any disinfecting liquid.

Poupinel ⁹¹ _{Aug. 10} maintains that heat is the best sterilizer for instruments. He prefers it dry, applied by means of a stove (oven?) at 356° to 392° F. (180° to 200° C.). Von Bergmann and Renard ⁹⁹ _{Sept. 20} recommend subjecting dressing materials and instruments to superheated steam under pressure. The articles are placed in wire baskets, and these are put into boilers. The temperature needful is about 230° F. (110° C.).

Redard ⁹¹ _{June 10} concludes an elaborate discussion of the subject of disinfection of surgical instruments and materials by a summary,

of which a few points may be noted here. Soaking of instruments or other articles in antiseptic solutions must, he says, be very prolonged if it is to be effective, and cannot be made so for trocars, hollow needles, sponges, etc. Heat is the disinfectant *par excellence*. The best method is by steam at 230° F. (110° C.), under pressure, the exposure being continued for fifteen or twenty minutes. Dr. C. N. D. Jones¹_{Feb. 11} advocates the use of steam heat in sterilizing instruments and materials for dressings. He describes and figures an apparatus for this purpose, known as the "Arnold automatic steam cooker," in which steam is generated from a pan of water by means of a Bunsen burner, and passes into a cylinder above; the articles to be sterilized are placed in this cylinder, in perforated receivers or wire baskets. An exposure of fifteen minutes is deemed sufficient. Terrillon⁸_{Jan. 4} regards boiling water as more efficient than carbolic acid in the sterilization of sponges. Terrier thinks the boiling should be several times repeated, so as to destroy all spores.

Tripier¹⁹⁷_{Dec. 15, '87} says that, on account of the occurrence of erythema or eczema from the use of gauze impregnated with phenic acid, he employed alcohol in its preparation, but found that the gauze or cotton so prepared was not antiseptic. Dry heat being destructive to the material, he employed steam heat with pressure successfully, but found it necessary to subsequently store the aseptic gauze or cotton in a dry and hot atmosphere. The utmost care was also observed in obtaining perfectly sterilized water for use in the dressings.

Adenot²¹¹_{May 20} reports the results of experiments made by him under the direction of Professor Tripier as to the temperature necessary for the sterilization, by steam heat, of cotton to be used in dressings. At 110° to 120° C. (230° to 248° F.), all microbes are destroyed, and it was found that this heat, applied by means of the "autoclave," of Chamberland, was effective for the above-mentioned purpose.

Glycerite of bichloride of mercury, containing one grain of the salt to every two minims, is said⁹_{Apr. 14} to have been used in several of the hospitals in New York and to have been found very convenient. It may be slightly tinted with fuchsine.

Lübbert and Schneider⁵⁰_{No. 12}; ⁹_{Apr. 21} recommend for the sterilization of gauze: —

Hydrarg. bichlor.,	.	.	.	.	.	.	3 parts.
Sodii chlorat. crud.,	.	.	.	.	.	.	100 parts.
Aquæ destill.,	.	.	.	.	.	.	600 parts.
Glycerinæ,	.	.	.	.	.	.	100 parts.
Spiritus,	.	.	.	.	.	.	200 parts.

The sodium salt being dissolved in the water, the solution is filtered, and then the sublimate, the glycerine, and the alcohol are added successively.

Parham¹² discusses the objections to the use of corrosive sublimate solutions, and the various means hitherto employed for obviating them. The chief of these, the irritant effect produced on the skin, Parham thinks may be best met by applying strong solutions (one part sublimate and five of acid, tartaric or hydrochloric, to one thousand of water) for a few minutes, substituting a much weaker solution in the permanent dressing. Or a few layers of iodoform gauze may be interposed between the skin and the sublimate solution.

Kocher, of Berne,²¹⁴ in a somewhat elaborate article entitled "A Simple Method of Accomplishing Asepsis," records his experience as decidedly against the use of catgut. He asserts that while this material was employed asepsis could not be secured by any known method, and cites thirty-one cases, in twenty-two of which the wounds were infected. Fine silk being substituted, he easily obtained good results. He uses torsion, tying only such vessels as cannot thus be controlled.

This report being discussed at the Société de Chirurgie in Paris,³ Lucas-Championnière thought the objection should lie against the mode of preparation of the catgut, and not against the material itself. Kirmisson suggested that Kocher's bad results might have been due rather to the use of bismuth in his dressings, but Marc Sée protested that he had employed this substance with entire satisfaction. Terrier thought that the surgeons present should declare together against the theory advanced by Kocher to explain the reverses with which he had met.

Reverdin⁵ says that crude catgut (not having been treated with oil), may be made absolutely aseptic by exposure for four hours to dry heat gradually raised to 284° F. (140° C.), being then placed for a day in oil of juniper, and afterward being kept in absolute alcohol.

Gross¹¹⁷ advises that catgut ligatures be first placed in a solution containing one part chromic acid, five parts glycerine, and

five parts water, for one week, then dried thoroughly, and then kept in a mixture of fifteen parts alcohol, one part glycerine, and 10 per cent. carbolic acid. For use they may be soaked in sublimated water, one to one thousand.

Drainage.—The question of the value of drainage and of the means of effecting it has attracted some attention. Kocher²¹⁴_{Jan. 1} prefers glass drainage-tubes, but thinks that none at all need be used if perfect antisepsis is secured. Trélat³_{June 27} thinks that in the great majority of cases drainage may be dispensed with if the wounds are accurately closed and aseptic. Championnière said that he used drainage always except in small wounds. Trélat thought that it was not the size of the wound only, but the difficulty of obtaining exact apposition, that made drainage needful. Championnière said that he used it as an additional means of security, but he thought the cure of wounds progressed equally well with or without it.

Ozenne¹⁴_{Jan. 18} advises that there should be no irrigation of wounds during operations, the blood being merely wiped away with iodoform gauze, and that no drainage should be employed. He dusts the closed wound with iodoform and applies a layer (several folds?) of iodoform gauze, with a layer of wadding over it. Rydygier⁸_{Aug. 2} gives very much the same views. In suturing he leaves here and there wide spaces between the stitches to allow of the escape of blood or wound secretions. He dispenses with drainage in only those wounds in which he is sure that nothing infectious has been left.

Whitehead, of Denver, Colorado,⁶¹_{Aug. 25} argues strongly for the value of drainage in the treatment of surgical wounds. He employs decalcified bone tubes, but thinks the perforated rubber tube of medium size the best for general use. Maylard²¹³_{Oct.} advocates the general use of rubber drainage tubes. He thinks it is better to err on the side of having them of too large than of too small calibre and too long rather than too short. He mentions several ways of securing the tube with silk thread or silver wire. A better plan is simply to pass a safety-pin through one side of the tube. Plugging should be carefully avoided.

Javaro says³³⁶_{Aug. 18} that rubber drainage tubes, softened by lying in antiseptic solutions, may be hardened again by exposure to concentrated sulphuric acid. Piskacek³³⁶_{Aug. 25} reports the excellent results

obtained by Briesky from the use of iodoformized wick as a means of drainage after vaginal hysterectomy and after laparotomy.

Antiseptic Appliances.—Holmboe, of Chicago, ⁸²_{Apr. 21} proposes to substitute for the pocket-cases, instrument-bags, etc., at present used, receptacles of canvas, with handles and straps of the same, which can be boiled in a 5 per cent. carbolic acid solution. A piece of hard wood, one-quarter of an inch thick, is placed in each to form a solid bottom. Instruments are wrapped in linen towels, stitched up so as to form pockets. These appliances can be disinfected as often as necessary by boiling. Dr. Ware, of Scranton, Pennsylvania, ⁵⁹_{Jan. 28} has described and figured a bottle containing a hard-rubber reel for preserving and carrying silk or catgut. The stopper is of soft rubber and is perforated so as to allow the threads to be drawn through for use. Kummer, ⁷¹_{Feb.} has devised a glass box and reel for the sterilization and preservation of silk thread for surgical purposes.

Needle-holders and forceps, so constructed that they can be readily taken apart and sterilized, are described by Otis, ¹_{June 16} and by C. N. D. Jones, ¹_{Mar. 24}. Husson, ⁵⁹_{Oct. 27} proposes a sponge-holder formed of a single piece of wire, which he thinks can be very readily made and kept aseptic.

The following articles may be specially mentioned: Kocher, ²¹⁴_{Jan. 1} von Mosetig-Moorhof, ¹¹³_{Jan. 15, Feb. 5, Apr. 8} W. W. Keen, ⁵⁹_{Jan. 28} Redon, ²⁴⁸_{May, June} and Gaston, ¹¹⁷_{Oct.}

Surgical Dressings in General.—Absorbent paper is again brought forward as a material for surgical dressings by Bedoin, ¹⁷_{Aug. 18}

In cases of scraping out and resection of tuberculous bones and soft parts, Girard, of Bern, ⁵⁹_{Sept. 29} claims to have obtained very good results by applications of equal parts of menthol and iodoform.

Carr, of Washington, D. C., ¹_{Dec. 1} calls attention to the great value of silk-worm gut as a material for sutures; it is not injured by long boiling or soaking; is strong, pliable, easy to tie, and is absorbed but slowly. This article is well known in Philadelphia. I have used it extensively myself, both tying it and shotting it like wire, but have never known it to be absorbed at all.

Hewetson, ⁶_{June 23} recommends the use of the combings of "China grass," an elastic, soft, silky, highly absorbent substance, which may be treated with a 4 per cent. solution of salicylic acid for use as an antiseptic surgical dressing. Its cheapness is a point in its

favor. O'Rielly²¹⁸_{Aug.} advocates the claims of "muskeg moss," a plant indigenous in the Northwest Territories, as an antiseptic absorbent material for surgical dressings. He soaks it in one to two thousand sublimate solution for use. His statement is that it is superior to absorbent cotton, at one-twenty-fourth of the cost.

Schmid, of Stettin,³³⁶_{May 12} speaks very strongly in favor of the treatment of wounds by suture of the deeper layers of tissue with catgut, closure of the divided skin with silk sutures, and then applying iodoformized collodion so as to exclude the air, forming, as it were, an artificial crust or scab.

Rockwell, of Michigan,⁵⁹_{Oct. 6} records his experience with the balsam of Peru as a dressing for wounds of all kinds. He claims that it is not only cleansing and healing, but is of considerable value as a hæmostatic agent.

Hargis, of Pensacola, Florida,⁹_{Mar. 2} advocates the dressing of wounds with oil of turpentine. After a thorough cleansing and removal of all foreign bodies, the parts are washed with water at about 100° F. (37.77° C.), dried with a clean, soft sponge, and adjusted; lint or absorbent cotton soaked in the oil is now applied, and then adhesive plaster if necessary; a roller bandage is next put on, and then a mixture of two parts oil of turpentine to one of linseed oil is placed over the site of the wound.

Millard⁴⁴_{Nov.} recommends the use of tincture of lobelia inflata as a dressing for recent wounds of all kinds, regarding it as superior to iodoform or carbolic acid.

McMurray¹⁰⁹_{Oct.} reports a case in which, having no other appliances at hand, he dressed several severe lacerated wounds with crude petroleum, under which healing took place within a week, suppuration being absent.

Baker, of Denver, Colorado,⁸⁰_{Oct. 15} speaks very highly of salicylic acid as an application to sloughing wounds and surfaces. He simply packs in the pure acid, covering it with cotton, kept in place by a bandage.

D'Ambrosio, of Naples,³_{Mar. 28} reports a very favorable experience in the use of small pieces of sponge, sterilized with sublimate solution, applied to atonic wounds and sores. (The idea would seem to be simply sponge-grafting, with antisepsis.)

Peck, of Shantung,²³⁵_{Dec. 87} recommends stearate of lime as a cheap

and efficient material for dressings. It is made by slacking ninety parts of quicklime with twenty parts of beef-suet or mixed tallow, with a sufficiency of boiling water, stirring the mass continually. When dried the result is a soft, white powder, which makes a good substitute for oleate or oxide of zinc. It may be used alone, or as a vehicle for medicaments or antiseptics.

Photoxylon, a substitute for collodion, has attracted much attention during the last year. Beringer^{237, 80}_{May, June} gives some facts as to its preparation. It is made by treating wood pulp with a mixture of nitrous and sulphuric acid with nitrate of potassium, forming a nitro-cellulose, or pyroxylon. Three per cent. of this is dissolved in a mixture of equal parts of alcohol and sulphuric ether, making a clear, thick liquid, which forms a very tough and adherent film when applied to the skin. Five drops of castor-oil may be added to each ounce to give flexibility. My own experience with this article enables me to testify to its superiority to ordinary collodion in the dressing of cuts or other small wounds.

It is stated¹⁴⁴_{Jan.} that when plaster of Paris refuses to "set" it need only be put into a suitable vessel and placed over a fire, when air and steam will escape from it. It will assume a fine, granular appearance, after which it may be used without difficulty.

Schede's method of dressing wounds, allowing them to heal under a moist blood-clot, is the subject of a very favorable report by Siepmann,⁶⁹_{Dec. 15, '97} assistant surgeon at the Bürgerspital in Hageman.

Lauenstein⁴_{Apr. 23} has found this method wholly successful in sixty-four out of seventy-four cases. He does not think it suitable for those in which immediate union is desired, nor where the iodoform tampon must be employed. Perfect rest is, he thinks, an important element in this plan of treatment.

It may be of interest to mention here that we have a report from our collaborator, Rev. Father Croonenberghs, of the Zambesi Mission, as to the surgery of the Zulus. He speaks of their treatment of wounds as especially remarkable and very successful. Their system is based chiefly upon the earliest possible obturation of all wounds. They extract any foreign body that may be present and then close the wound, carefully excluding the air by means of a thick paste compound of charcoal and mutton-suet.

MATERIALS FOR DRESSINGS.

Neudörfer¹⁶⁹_{Apr.} asserts that antipyrin is not only an anodyne, but an antiseptic more efficient than carbolic acid. Its cost is as yet an obstacle to its general employment.

Jessett¹²⁸_{Apr.} states that he has found "sanitas" to possess the properties needed for the antiseptic dressing of wounds, ulcers, cancer, etc., in a higher degree than any other article hitherto proposed.

Creolin, a product of the dry distillation of English coal, introduced into German surgical practice by Esmarch, has been variously reported on. Extravagant claims were made for it, which have not been wholly verified by all who have tried it. Kortüm¹¹³_{Mar. 11} commends it highly in obstetrics. Neudörfer,⁵⁷_{Apr. 29} while admitting that it has toxic properties, thinks it preferable to other antiseptics. It is also a styptic. It may be used in watery solution, one to five to the thousand parts; stronger solutions are irritating. Or five parts creolin may be added to one hundred of alum, to make a dusting-powder. It may also be combined with oil or with glycerine for various purposes.

Marked antiseptic properties are claimed by Lubbert²⁶_{Aug. 1} for a new article, called oxynaphoic acid, a derivative from naphthol. It is, however, very poisonous, very volatile, and its fumes irritate the air-passages.

The naphthols have been investigated by Justus Wolff¹⁰¹_{Apr.} with the result of placing *beta-hydro-naphthol*, known in commerce simply as *hydro-naphthol*, among the most powerful antiseptics, while it is quite harmless to the living tissues. The other substances of this group—*alpha-hydro-naphthol*, *alpha-anhydro-naphthol*, and *beta-anhydro-naphthol*—are poisonous, and hence their antiseptic properties are not available.

Reverdin³_{Oct. 17} has obtained good results from the substitution of *beta-naphthol* for iodoform as an application to wounds and for the preparation of gauze for dressings.

Flemming²_{Sept. 22} has found glycerine of starch, with corrosive sublimate added in the proportion of one to one thousand parts, to possess the essential qualities of blandness, antiseptic power, and absorbency as a dressing.

Gaston, of Atlanta, Ga.,¹¹⁷_{Oct.} recommends camphor and turpentine, one drachm (four grammes) of the former to one fluidounce

(thirty-one grammes) of the latter, as a perfect antiseptic dressing. For continuous use it may be mixed with olive-oil in any desired proportion.

In order to test the purity of iodoform, it is stated^{224 Feb. 4} that a practical plan is to shake a portion up with distilled water, filter, and treat the liquid with alcoholized solution of nitrate of silver. If in twenty-four hours no precipitate occurs, or only a slight grayish cloudiness, the iodoform may be regarded as pure. Toxic symptoms are said to have become much rarer with the improvement in quality of the drug as furnished.

Of the various methods of masking the odor of iodoform, there is, perhaps, none more efficient than its mixture with balsam of Peru, although Charteris^{224 Feb. 4} is said to have successfully employed a combination of musk, oil of almonds, and two or three minor perfumes for the purpose.

Bituminated iodoform (iodoform and tar) is recommended by Ehrmann, of Vienna,^{5 Oct.} as superior to iodoform alone in being almost free from odor, in not causing erythema or eczema, and in not causing redundant granulations at the centre of ulcers, the edges remaining undermined.

In order to prepare iodoform gauze with accuracy, it is proposed^{80 Oct.} to weigh the gauze, and then to weigh out the iodoform; next to saturate the gauze with ether; wringing the ether out, the iodoform is dissolved in it and the gauze immersed in the solution, wrung out, and again immersed; now it is lifted out by opposite corners, allowed to fall open, and waved gently to and fro, when the ether quickly evaporates and leaves the gauze uniformly and accurately impregnated with the iodoform.

Habart,^{113 Feb. 26; Mar. 4, 11} in a series of three articles, discusses antiseptic powders for dressings. His experiments and clinical observations have led him to regard *Kieselguhr* or *Vergmehl*, obtained by the calcination of certain infusorial earths, as the most valuable of all these articles. It may be variously medicated with carbolic acid, chloride of zinc, salicylic acid, iodoform, iodol, or bichloride of mercury. In military practice especially the application of dry antiseptic powders with a gauze bandage is recommended.

Jaksch^{209 Oct. 3} recommends as a dusting-powder a mixture of one or two parts creolin to ninety-eight of iodoform. The odor of the latter is disguised, and its action not in any degree lessened.

Von Rotter⁸³⁶_{Oct. 6} recommends the following as a cheap, soluble, colorless, and odorless, easily transported powder for making an antiseptic solution: Corrosive sublimate, .05 part; chloride of sodium, .25 part; carbolic acid, two parts; chloride and sulpho-carbolate of zinc, each five parts; boric acid, three parts; salicylic acid, .6 part; thymol, .1 part; citric acid, .1 part. This is to be dissolved in twenty thousand parts of water. The advantage claimed for such a combination is that it is supposed to give the special action of each ingredient without the irritative effects. Lépine, of Lyons, ²²⁴_{Apr. 23} regards this claim as valid, but it is strongly denied by Neudörfer.

Oxycyanide of mercury is said by Chibret¹²_{Sept.} to be a germicide of rather more power than the bichloride. It is well tolerated by the tissues, and is thought to be specially applicable to suppurating surfaces, or to mucous membranes, as the conjunctiva, to render them aseptic.

TRAUMATIC NEUROSES.

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UNDER this head are included all the functional or quasi-functional morbid states of the nervous system which result from injury, and which had (previous to last year) been variously designated as *cerebrospinal concussion*, *spinal concussion*, *railway spine*, *railway brain*, etc., by different observers. That the majority of such cases result from the violent shocks endured by the victim of railway accidents is true, but it is universally acknowledged that there is nothing specific in such accidents, and that the same symptom-group may be produced by any form of accident causing shock and fright. The subject has received a great deal of attention during the past year, and the following review is based upon a study of the contributions of Oppenheim^{4, 1228}_{No. 9, 1899}; Knapp, of Boston,⁹⁹_{Oct. 1, 9} Strümpell,⁴⁷⁵_{Feb. 16} Baginsky,⁴_{Oct. 1} Wolff,⁴¹_{July} and Shaw.¹⁰⁹ Dr. Knapp's paper was read before the American Neurological Association at its meeting in Washington, September, and was discussed by Drs. Gray, Zenner, Seguin, and other members of the Association. The papers of Oppenheim, Wolff, and Knapp furnish us with more or less sufficiently detailed histories of fifty cases observed within the last five years. In a praiseworthy attempt at conciseness, Knapp has too much abbreviated his twelve cases, but the thirty-eight observations of Oppenheim and Wolff are full of valuable details. Baginsky's paper relates exclusively to aural symptoms after concussion injuries, and Shaw's case will only be referred to to show that gross simulation may be added to real symptoms by a designing patient. The following researches are based upon a study of the above essays and papers, and are independent of the older and much controverted views as to the existence and nature of "spinal concussion."

Semeiology and Diagnosis.—No disagreement exists as to the fact that any and all of the functions of the nervous system may be prevented, abolished, or exalted after concussion accidents. It

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would require pages to reproduce in detail the various symptoms thus produced. Suffice it to say that the psychic, sensory, special sensory, motor, and so-called trophic functions may be altered and give rise to symptoms variously grouped. No two cases are alike, yet a certain resemblance, though we must say one that is made inevitable by the universality of the nervous disorder, exists between cases occurring in different localities, in various countries, and after divers accidents.

A general classification is necessary, and we can do best by following Oppenheim's division of cases in three classes—first, traumatic psychosis; second, traumatic general neuroses; third, traumatic local neuroses. This classification serves the purpose of the study of cases and does not anticipate or prejudge the further diagnosis of organic changes in the central nervous system of purely hysterical disorder, or even of malingering.

The meaning of traumatic psychosis is generally understood, yet Oppenheim and Wolff very rightly would extend its meaning a great deal. They have recognized the fact that in all forms of traumatic neuroses a perversion of the emotional function is present and often precedes the appearance of the more ordinary or somatic symptoms. Fright is the primary element in this traumatic mental disturbance and in some victims the only symptom. Allied to it is a depressed, hypochondriacal, or so-called hysterical psychic state, which persists in some cases and dominates the whole complex symptom-group. The patient becomes pathologically egotistic; he thinks only of his injury, of his suffering, of his helplessness, of the dismal future prospects of himself and his family, of possible new and worse symptoms, of impending death. The whole mental tone is dark and self-centred, the circle of ideas becomes (as in melancholia) more and more limited. This quasi-monomania leads to apparent loss of memory, to emotional outbursts, and is an admirable preparation for the operation of the law of suggestion, whether by outside influence or by auto-suggestion. This state is also one which is intensified and aggravated by medical visits and discussions, by reading of medical literature, and by the suggestive questioning or prompting of lawyers who become interested in the case. A "leading question," medical or medico-legal, planted in such a psychic soil is pretty sure to bear fruit; it germinates and expands later in the shape of new and

“interesting” symptoms, the reality of which the patient never doubts. The importance of the recognition of this mental state for diagnostic and prognostic purposes cannot be overestimated, and we believe that much of the incurability of “railway cases” is due to the fact that a psychical treatment is not, and perhaps cannot, be attempted at an early period. Once fully developed, like hypochondriasis, its removal is very doubtful.

Another progressive step, logically related to the above, is the recognition of the fact that many of the symptoms of traumatic general neuroses (and even of traumatic local neuroses) are due to cerebral and not to spinal disorder. For this great advance in our knowledge we are indebted to American physicians, more especially to Putnam and Walton (1883 to 1884). This knowledge, that most of the symptoms of so-called “railway spine” are due to cerebral disturbance, paved the way for our latest idea that in many of these cases the symptoms are really of subjective origin and due to auto-suggestion (Charcot and others). If we carefully analyze the symptoms presented by cases belonging to the groups of traumatic, psychic, and general neuroses we are struck by the fact, noticed by many writers, that almost all the symptoms are subjective or quasi-subjective. True, Oppenheim, Wolff, and Knapp refer to concentric limitation of the visual field and atrophy of the optic nerves, as observed in a small number of cases, but this does not invalidate the statement that in the vast majority of cases the extremely varied symptoms observed are subjective and not susceptible of demonstration. We have no hesitation in classing anæsthesia among such symptoms. Nothing is easier for an ordinary human being than to resist the slight pain inflicted in ordinary tests for anæsthesia. In none of Oppenheim’s, Wolff’s, and Knapp’s cases was the crucial test of faradic excitation by a wire point tried. Pricking and pinching are useless tests, and even the intense secondary faradic current delivered by a single wire may be withstood by a normal human being. This I have witnessed.

As regards motor symptoms, it is noticeable that in these cases, excepting those where a local definite injury to a member was produced, true paralysis, and especially the reaction of degeneration, were absent. The walk, when affected, differs from that of any known symptom-group indicating central nervous disease. Reflexes, more especially the patellar reflex, are, as a rule, increased.

The abolition of the knee-jerk has been so rarely observed (not once in Oppenheim's thirty-three cases) that it may be accounted for by the law of its occasional absence in healthy persons. The increase of reflexes has, in our opinion, no diagnostic value, the most extreme examples of it which we have seen having been in cases of common sexual neurasthenia.

The action of the bladder is often reported as abnormal, but in most cases this is impossible of verification; we must take the patient's word for the incontinence or irregular micturition, which he can most easily produce.

Impotence, which is so often complained of by victims of accidents, is a still more unreliable symptom; yet Knapp alone makes the statement that it is a worthless symptom, as it may coincide with any condition in which pain and weakness exist, and, he might have added, it is also a very frequent result of psychic depression. Besides, we are utterly unable to control the patient's assertion on this point, which usually appeals very strongly to the sympathies of a masculine jury. Cases are recorded where fecundation was successfully accomplished by a "victim" shortly after a favorable verdict.

The reader who carefully peruses Knapp's able summaries of the symptom-groups usually presented by concussion cases (pp. 28-34), if he has had much experience in neurological practice, will recognize an astonishing similarity, if not identity, with a large group of *non-traumatic* cases which annoy the physician so much by their vagueness, their subjectivity, and by the condition so much insisted on by the writers cited, viz.: their incurability. We acknowledge that we do not fully understand the pathology of these cases, which we classify as hypochondriacal, hysterical, or even delusional, and which we sometimes see twenty years after the beginning of symptoms sometimes much worse, but usually not so in reality. It seems to me that this striking resemblance, in all but etiology, between concussion or traumatic general neuroses and psychoses, and those just referred to, is worthy of more consideration than it has yet received.

Another point, in connection with semeiology, is that in the related cases (and in cases seen by me in consultation) no pains appear to have been taken to make sure that none of the symptoms complained of existed prior to the accident. More especially

should this possible pre-existence be studied in the instances of lumbago, insomnia, weakness of the sexual and urinary organs, feeble memory, and tremor. Of course, the patient's denial should count for little, and it may be impossible without detective assistance to arrive at a knowledge of the truth.

That some of the symptoms enumerated by the writers on spinal and cerebral concussion are aggravated or may even be produced by the use of bromide of potassium, as claimed by Page,⁶¹_{Apr. 4, '86} we feel confident. For depressed, self-observing, neurasthenic, or hysterical patients we consider the bromides (and morphine) to be most injurious agents—almost poisons. Hysterical attacks multiply, paræsthesiæ become more pronounced, the will and memory are weakened; in short, the vitality and reactive power of the entire nervous system are lowered by those drugs (and in some persons by relatively small doses). We make this statement carefully, from the study of a number of traumatic cases exhibiting the symptoms referred to. The bromides are still frightfully abused in medical practice.

Etiology and Pathology.—Oppenheim and Knapp lay some stress on the genesis of some of the symptoms in their patients by suggestion, but they do not write as if fully conversant with the power of this source of nervous disorders. They nowhere state, what has been known now for two years or more, that in perfectly healthy persons serious nervous symptoms may be produced by hypnotic or by non-hypnotic suggestion. Anæsthesia, paræsthesia, spasm, paralysis, blindness, and deafness, complex acts, may be imposed on the healthy (non-hysterical) subjects of hypnotic suggestion, and the results may even be obtained hours or days after the suggestion is made (*vide* Berheim, American translation by Herter, New York, 1889). Auto-suggestion is also now recognized as a frequent source of “symptoms” in traumatic and in non-traumatic neuroses. Strangely, Strumpell, in his otherwise well-written essay, entirely ignores the element of suggestion in the genesis of symptoms.

Another source of the persistence and aggravation of symptoms, strangely overlooked by all the writers cited, is sympathetic care. What is more injurious to the subjects of hypochondriasis, of certain forms of neurasthenia, and of traumatic neuroses than constant watching by friends, questioning as to feelings, conver-

sation about symptoms, results in other cases, etc.? In private practice we seek at once to eliminate this source of aggravation and perpetuation of symptoms, and the brilliant results of the seclusion treatment attest the correctness of the view.

That the central nervous system, more especially the brain, may be injured by concussion in such a way as not to cause immediate vulgar symptoms like paralysis, anæsthesia, or epilepsy must be admitted. Punctate hæmorrhages doubtless do occur in the central organs as results of injury, and may give rise to secondary lesions such as sclerosis and tumors. But, after all, taking even the cases related by Oppenheim, Knapp, and Wolff, such results are rare, and after a time the symptoms assume such a grouping as to justify a diagnosis of organic disease. In cases of traumatic local neuroses (Oppenheim) with reflex or sympathetic symptoms in parts of the body other than the one injured, an organic or real functional disorder may be admitted, but such cases have long been known outside of the subject now under discussion.

The escape of persons who are asleep at the time of a railway accident from the symptoms of traumatic neuroses is admitted by all writers, and should exert a powerful influence on our judgment of the pathology of the affection.

Another fact is also worthy of a good deal of weight in this connection, viz.: that those victims of an accident who receive a gross external wound rarely suffer from the functional disorders. We say rarely, because the three authors referred to each relate remarkable exceptions to the rule, which remains, nevertheless, a rule of considerable value.

The argument that because many of the cases never recover there must be organic disease we must condemn as worthless. There is no necessary connection between the incurability of symptoms and their organic basis. This is shown by the study of cases of hypochondriasis, neuralgia, paraneia (or monomania), and of hysteria, which go on progressively for an indefinite number of years.

It has seemed to me that the question of malingering is not fully considered by writers on this subject. They all refer, more or less, to deliberate malingering, which we admit is rare. But in private practice, in cases of non-traumatic neuroses, we are constantly confronted with the elements of exaggeration and positive false statements by patients who have no immediate or pecuniary

object in view. Under the most unexpected circumstances we discover, usually long after the first examination of a case, that certain symptoms are either purposely produced or grossly exaggerated. In the railway cases we have examined this element of possibly non-deliberate malingering has been very prominent. For example, in a case recently seen, the patient could half lift and turn her heavy body by the help of her hands, yet her grasp on the dynamometer gave the ridiculous figures of five and three degrees, or, in other words, no grasp at all. Another variety of malingering is that in which the attempt is made to make an accident responsible for symptoms which are otherwise produced, and which may have preceded the injury. In one case seen by us the effects of chronic alcoholism and morphinism were attributed to a slight blow on the head. In another more recent case the symptoms of the menopause, exaggerated in statement and with unquestionably false addition, were laid at the door of a simple fall on a level surface. That gross malingering may be superadded to real symptoms due to organic disease is well shown by the case reported by Shaw, in which such specialists as Mulhall and Alt unhesitatingly pronounced the optic and aural symptoms complained of by the patient as fabrications. Writing in 1886, I said: "In most cases of malingering, and in some cases of so-called railway spine, the symptoms so loudly complained of belong to the two classes of hyperæsthesiæ and paræsthesiæ. They are undemonstrable and non-measurable: only the patient himself can vouch for their reality. A diagnosis in such cases, without objective symptoms indicating well-known lesions, should be very reserved."

One is struck in reading last year's papers on this subject with the apparently full credence given to the patients' statements. In strictly private practice we are constantly being misled negatively and positively, or even grossly deceived by neurotic patients, and the greatest care is required in sifting the patient's statements to get at the truth. Sometimes we only learn the true bearings of a case in a roundabout way after the patient has passed from under our observation. If this be so, how much more should we be on our guard, with the spirit of scientific doubt, in cases presenting the peculiarities of traumatic neuroses?

Prognosis and Treatment.—Opinions vary greatly as to prognosis. Few cases die, and autopsies are almost unknown (in the

last five years). Out of the fifty cases which form the basis of the essays reviewed, three died, and in one only was an autopsy made. This was case twenty-three of Oppenheim, which presented most of the typical symptoms of cerebrospinal commotion, with decidedly hysterical background. She died of phthisis, and the autopsy made in the summer of 1887 showed no gross lesions of the nervous system. No further report is made, so that we must conclude that no microscopic changes were found. Knapp, Oppenheim, Wolff, and Strümpell agree in stating that most cases are incurable. This is in striking contrast to the results of Hodges' studies.⁹⁹ His own results in twenty-one cases showed twelve cured, six almost cured, and three unimproved. More striking still is his statement that a prominent lawyer of Boston, much employed by the plaintiffs in such cases, told him that he had yet to see a case (of railway spine) that did not recover. Between these extremes the mean statement may be made that traumatic neuroses, like the non-traumatic, are extremely obstinate affections.

The fact that recovery does not always or often follow upon the award of damages to a plaintiff-patient has been interpreted to mean that real organic disease exists. This, we think, is an erroneous view. Supposing the case of a predisposed person, frightened and jarred by a severe accident, who subsequently receives harmful sympathy from relatives and physicians, who is made the object of multitudinous suggestions by physicians, lawyers, and friends, whose volition and reactive power are impaired by nervines and sedatives, even without a trace of voluntary or intentional malingering, a neurotic state is developed which gets beyond—utterly beyond—the control of the patient and the influence of treatment. The patient has lost hold of his nervous system, something after the fashion of the morphinist, and cannot regain control. This, we think, explains the incurability, by damages or by drugs, of some cases.

The treatment bears a close relation to the prognosis. Perusal of the cases reported in the last five years shows that treatment has been very imperfectly, often injuriously, attempted. In the case seen by me, this has been pre-eminently so. In several instances the treatment had been such as to favor the development of a general neurosis in a healthy person, by ill-advised sympathy and absurd precaution, by the use of bromides, chloral, alcoholic

stimulants, and constant fussing with individual symptoms. Since fear, morbid self-watching, suggestion, auto-suggestion, and sympathy are so well recognized as being factors exerting evil influence on traumatic and non-traumatic neurosis, separation from the family, seclusion, and a strictly tonic treatment, medicinally and morally, would seem to be the fundamental parts of a rational treatment. In the last fifteen years, thanks to the labors of Weir Mitchell, the non-traumatic cases of this class have been so treated whenever consent could be had, and, as is well known, with good results previously unheard of.

I firmly believe that if traumatic cases were so treated from an early period, the results would be vastly different from what they now are, and the diagnosis of possible "slight organic changes" in the central nervous system would become much more rare.

The medico-legal question is not much simplified by the analytic conclusion that organic changes in the nervous system are rarely set up by general traumatic shock, or by the discovery in a given case that many of the symptoms observed are due to the patient's own conscious or unconscious action, or to misdirected or neglectful treatment. The subject is disabled when seen, and probably will be so indefinitely, or at best will only be able to take up the simplest sort of occupation. No one would deny that an employer or corporation under existing laws is as much responsible for permanent *functional* disability as for one due to evident organic changes. Yet the expert and the jury are often beset by the idea that, in functional cases, improvement *may* ensue. A much more serious question, from an ethical and equitable point of view, is whether an employer should be held responsible for the results of fright and allied mental conditions. This, if affirmatively answered, would open the door for endless claims. For example, a neurotic person is not injured in any way during an accident but is intensely frightened and disturbed; he does not regain control of himself for months or years. Is the company responsible? Again, a woman witnesses an accident, as a mere spectator; she is intensely affected, faints, perhaps aborts, perhaps is afflicted with various nervous symptoms for months and years after. Is the company responsible? If not, why mulct the company for damages in the case of a "victim" of the accident itself, who has received

no tangible injury of the nervous system, but who develops psychic and general traumatic neurosis? Wherein lies the ethical difference? Again, let us suppose the case (very far from rare, we believe) of a person who is jarred and frightened in an accident, who is coddled and demoralized by sympathetic friends, who receives innumerable *suggestions* from his friends and his medical advisers, who is dosed with remedies which lower his nervous vitality and utterly prevent a normal reaction from the shock, and who is thus led into the valley of chronic (often incurable) invalidism. Who is most responsible in such a case? The greatest difficulty in reaching a just conclusion as to the medico-legal bearings of a given case lies in our (Anglo-American) system of medical testimony. Under this system, for the perpetuation of which the legal profession is distinctly responsible, so-called experts are called to testify as to the state of the plaintiff, his chances of recovery, etc. Often, the "experts" are physicians who have absolutely no standing in the specialty to which the case belongs. Often, too, "experts" are asked to testify on a case which they have never seen; they are called to answer the famous "hypothetical question" about the case on trial—a question which is always unscientific, and often constructed solely with the view of aiding the *legal* aspects of the case, on one side or the other. It is my opinion, as it has been my consistent practice, that a medical man should absolutely refuse to answer "hypothetical questions," and even that he should decline to give any opinion about a case he has not had the opportunity of examining. How long would the absurd practice of giving an opinion without having seen the patient, on the presentment of certain questions by a lawyer, be tolerated by families in private practice? It would seem best to try to attain a knowledge of the truth in medico-legal cases by the same methods which are employed for the same purpose in obscure cases in private practice; *i.e.*, by the aid of unbiased consultation between physicians known to excel in the specialty to which the case belongs. If the court were to appoint, or both sides to a suit or claim were to agree upon, real experts to fully examine the case, discuss it together, and present a written report, differences of opinion might still occasionally occur, but they would form the exception, instead of, as under the present system, the rule.

Under the present system, medical witnesses are, I believe, inevitably biased; seldom by hope of pecuniary reward, but by the inevitable laws of the human mind, which lead us to accept and sympathize with the view of a question which is first presented to us. We, humanly enough, have a mental bias in favor of our client and his family. The bias and prejudices of juries also constitute a formidable obstacle to justice, but this is a matter which does not properly come under the medical considerations of the question. We believe, from personal acquaintance with a great many physicians who are called as "experts," that the medical profession will welcome a change in our laws which shall substitute true expert opinion for what now masquerades as such in our courts.

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